MATHEMATICS

Part - 1

Standard

V

Government of Kerala
Department of General Education

Prepared by
State Council of Educational Research and Training (SCERT) Kerala
2024

ST-355-1-MATHS (E)-5-VOL-1

THE NATIONAL ANTHEM

Jana-gana-mana adhinayaka, jaya he
Bharatha-bhagya-vidhata
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gahe tava jaya gatha
Jana-gana-mangala-dayaka jaya he
Bharatha-bhagya-vidhata
Jaya he, jaya he, jaya he,
Jaya jaya jaya, jaya he.

PLEDGE

India is my country. All Indians are my brothers and sisters.

I love my country, and I am proud of its rich and varied heritage. I shall always strive to be worthy of it.

I shall give my parents, teachers and all elders, respect and treat everyone with courtesy.

To my country and my people, I pledge my devotion. In their well-being and prosperity alone, lies my happiness.

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Prepared by
State Council of Educational Research and Training (SCERT)
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Dear Students,

We have learnt a lot about mathematical concepts like numbers, shapes and patterns. We have also had a better understanding of these concepts and acquired necessary skills related to them.

We have grasped the logic of mathematics too.

We are now able to find the relations between numbers, complete patterns, draw figures, analyse equations and find different ways of solving problems.

But we need to acquire more knowledge.

We have to grasp the idea of larger numbers, the relation among numbers and their more complex computations, harder and trickier solutions, deeper and more profound exercises involving mathematical concepts.

Let us freely, joyfully and confidently move forward together.

With regards,

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The icon below is used in this textbook for convenience


Let's do problems

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a [1]**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the [2][unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

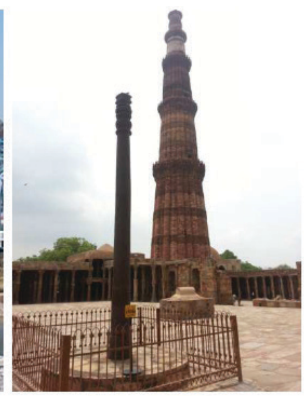
---

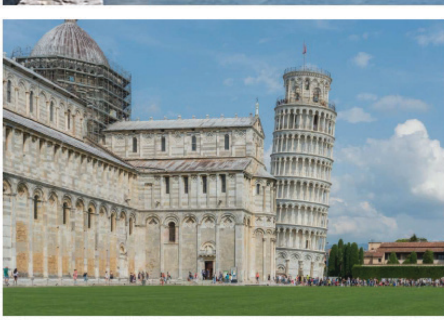
1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

1

Lines and Circles

Line math





Did you see the pictures?

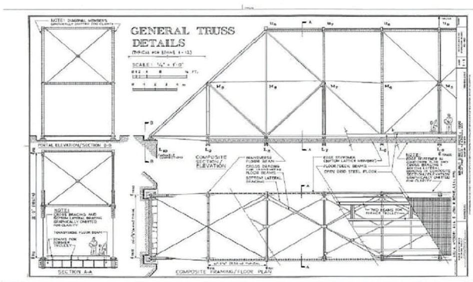
A bridge made with upright pillars and slanted supports.

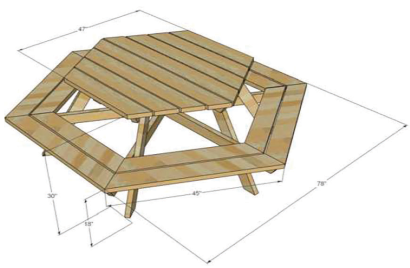
Qutb Minar and the iron pillar in front of it, standing straight

The Leaning Tower of Pisa, built though vertical, but tilting in time

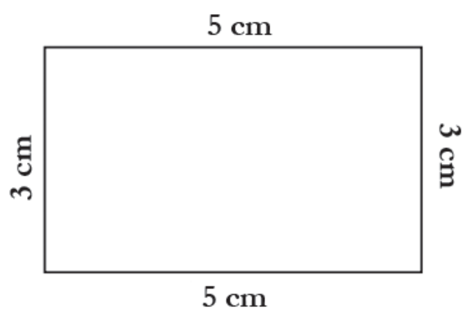
A table made with planks of straight and slanted edges, and legs straight and slanted.

Before actually building these, bridge or table, accurate plans must be drawn:

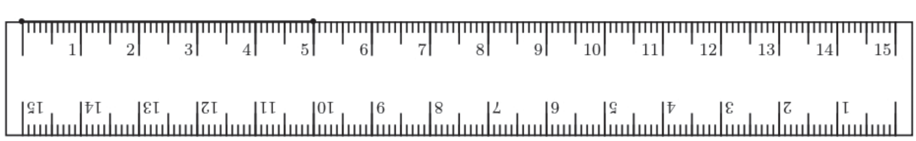




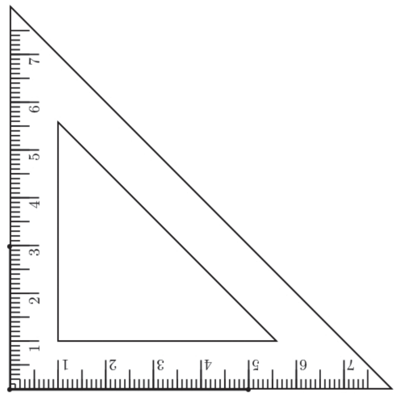
Let us also start to draw. First a rectangle:



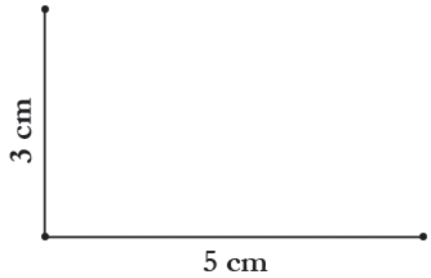
First, let's draw the bottom line using a scale.



Now, from one end of this line, let's draw upward another line of 3 centimetres. For this, we are going to use a set square from the geometry box.

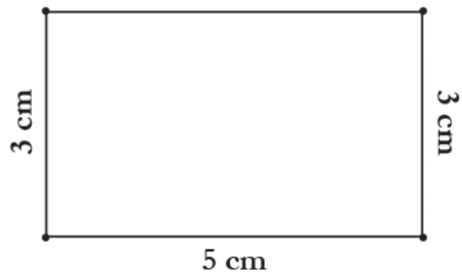


That makes half the rectangle.



Now in the same way draw a 3 centimetre line, straight up from the other end.

By joining the tops of the two vertical lines, we have our rectangle:



Don't you have a question here?

We didn't actually measure the top line, did we?

Would it be also 5 centimetres?

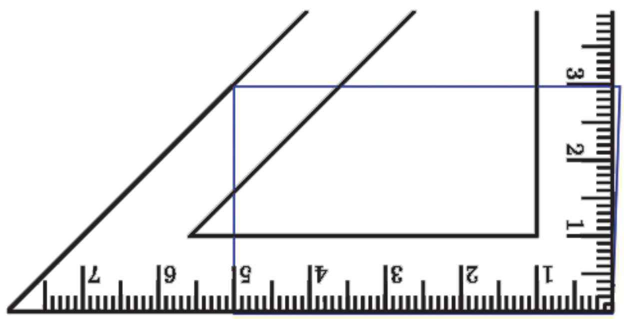
Measure it and check. If you have drawn the left and right sides without any slant, it will also be 5 centimetres.

Now look at the picture.

Are the left and right lines exactly straight up?

The right side seems to be a little off, doesn't it?

Let's check it with a set square.



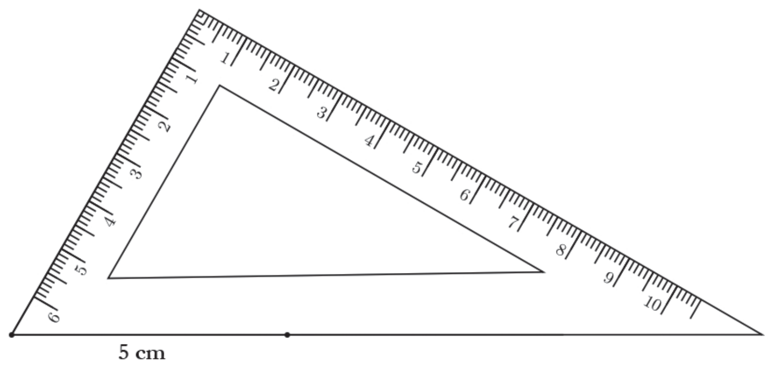
Now measure the bottom side and the top side.

Are they of equal length?

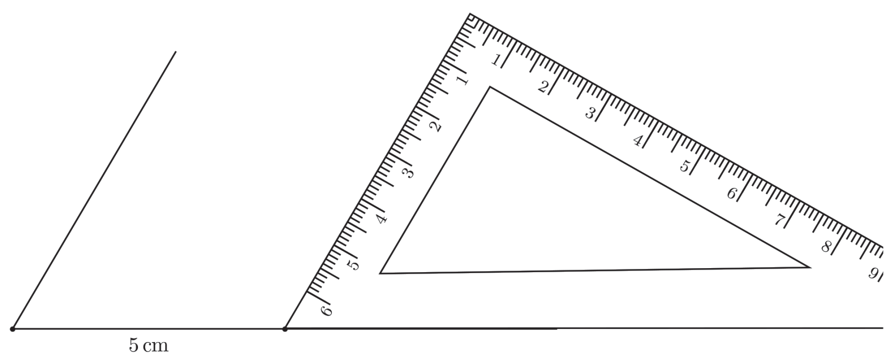
Let's draw another picture.

Draw a long line and mark off 5 centimetres from the left.

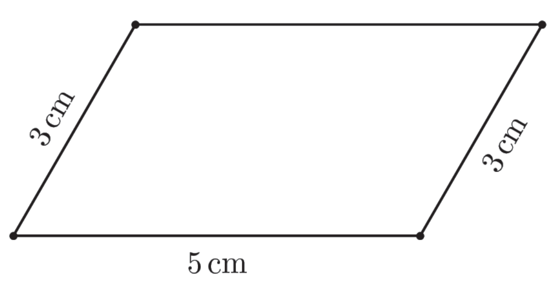
Place the longer set square at the left end as in the picture below and draw a line.



Now slide the set square 5 centimetres to the right and draw another line like this.



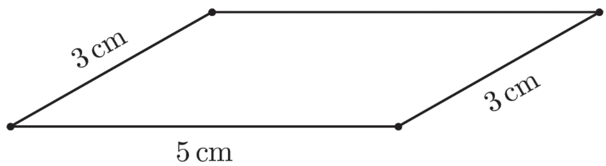
Mark off 3 centimetres on both the slanted lines and erase the rest of the lines. Draw a line joining these two ends. Erase the part of the bottom line also beyond the 5 centimetre mark.



Measure the top side.

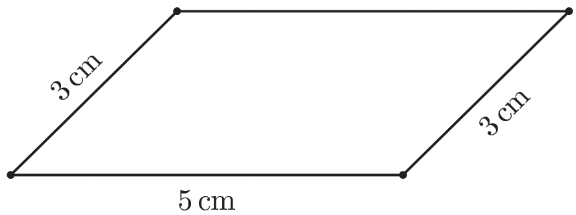
Isn't it also 5 centimetres?

If we use the other corner of the set square instead, we will get a picture like this.



Try it!

We can draw another picture as given below, using a corner of the other set square:

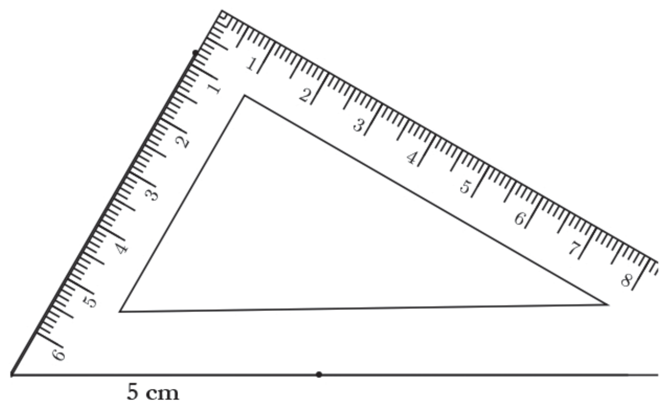


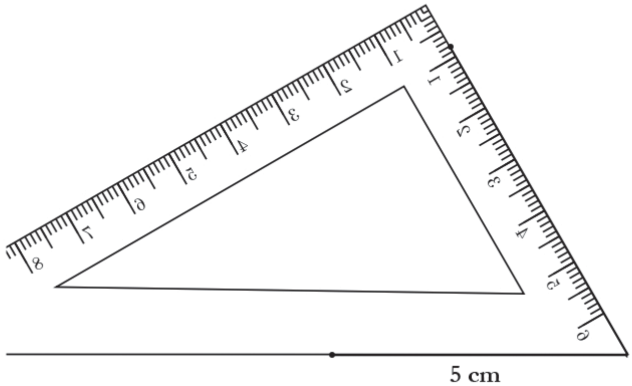
Measure the top sides of each picture. Are they 5 centimetres long?

In an earlier picture, when the right side was a little tilted, the length of the top side changed. But in all the three pictures drawn now, though the left and right sides were tilted, the top length didn't change

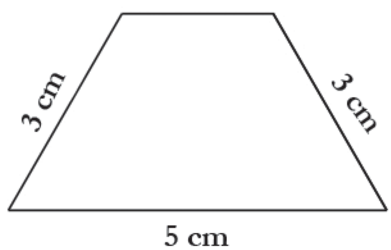
Will the length of the top side remain unchanged even if we tilt the left and right sides to any extent?

Suppose we put the set square at the ends of the 5 centimetre line like this?

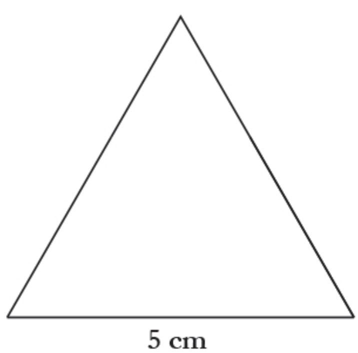




How about marking 3 centimetres off from both the slanted lines and joining the ends?

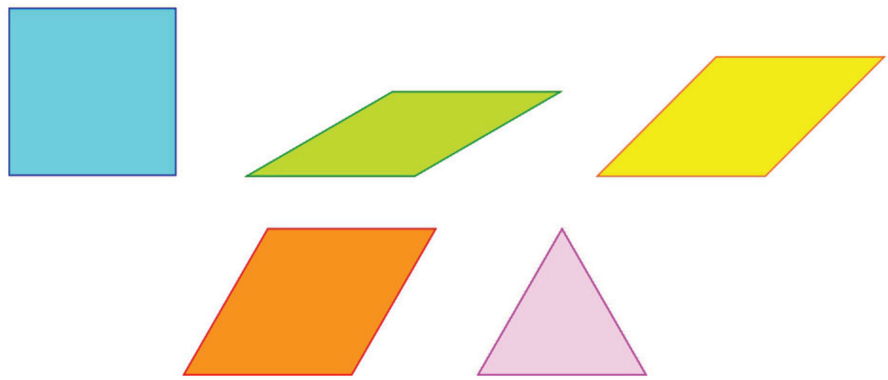


If we extend the left and right sides, we get a triangle like this.

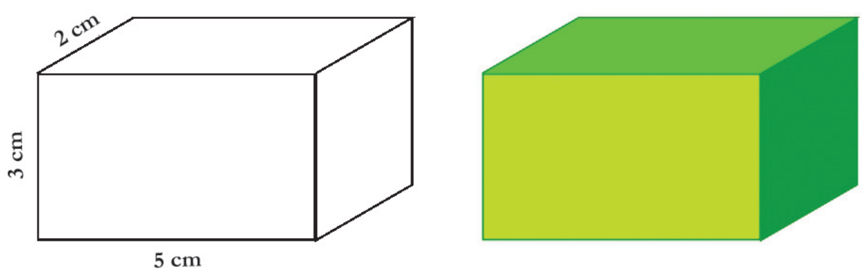


We have measured the slanted sides of the triangle. Now, using a scale and set squares, try drawing these pictures.

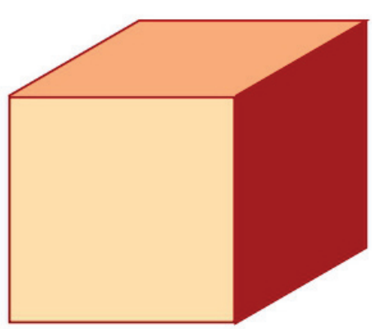
1. All the lines in the pictures below are of 3 centimetres length. Draw and colour them:



2. Draw the first picture with lengths as shown and then colour it as in the second picture.



3. Draw this picture.



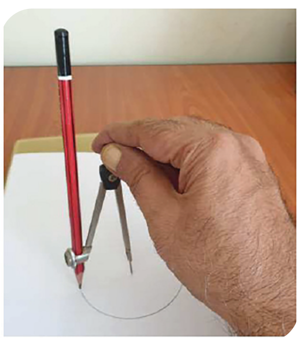
Circle Math

Isn't it easy to draw a circle ?

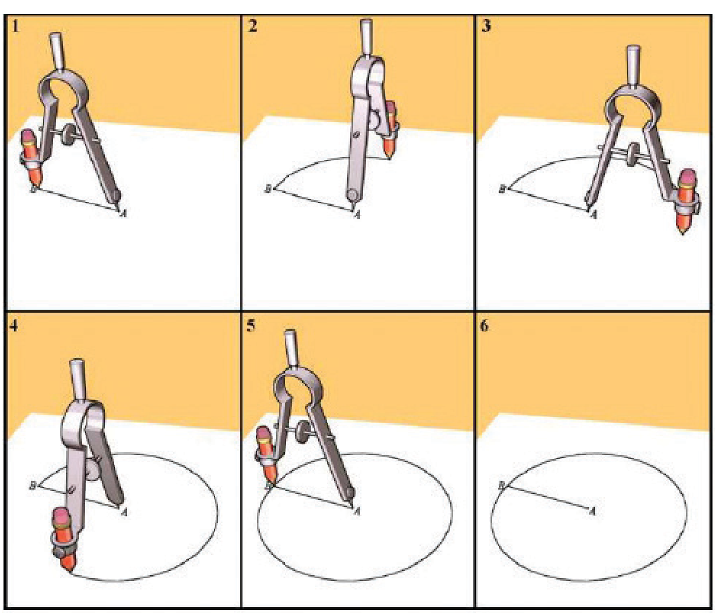
We can use coins or bottle caps to draw small circles.

If we want a bigger circle, then a bangle or the lid of a tin etc. can be used.

There's a tool in the geometry box to draw circles of any size we want. It's called a compass.



When we draw a circle like this, the distance between the legs of the compass shouldn't change in between; it should be the same from start to finish:



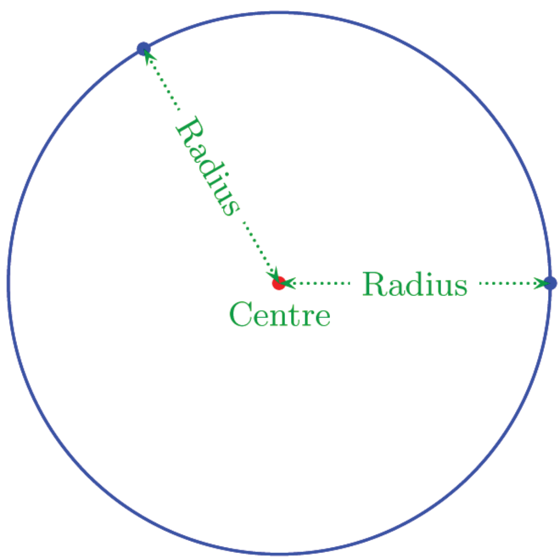
When drawing a circle, we keep its needle fixed at a point and then draw with the pencil around it, right ? Throughout this round trip, the pencil point is at the same distance from the needle point.

In the language of Math, this can be stated as follows:

A circle is the path traced by a point moving at the same distance from a fixed point

Circle is the name of the round shape in the language of Math. There are many concepts related to it.

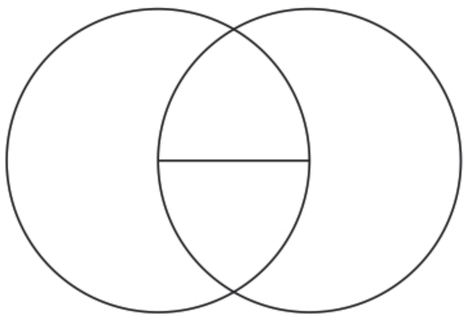
- The unmoving point in the middle is called the 'centre of the circle'
- The unchanging distance between the unmoving point and the rotating point is called the 'radius of the circle'.



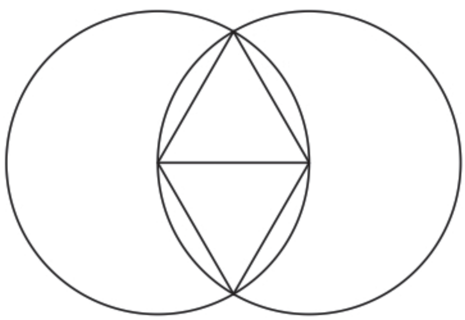
So, how do we draw a circle of radius 4 centimetres?

Now let's see how we can create pictures by drawing many circles.

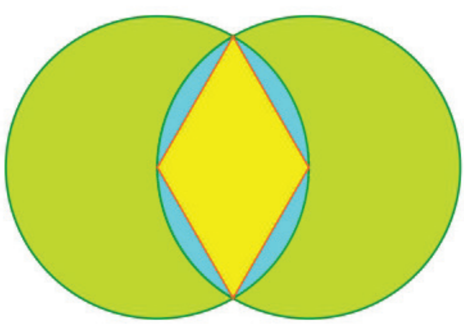
Draw a line, not too long. Draw circles with the end points of the line as the centres; with the length of this line as the radius.



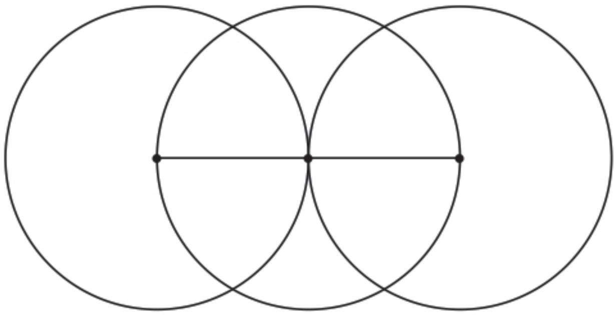
Draw lines from the end points of the first line to the points where these circles cut each other.



Now try colouring the picture as given below.

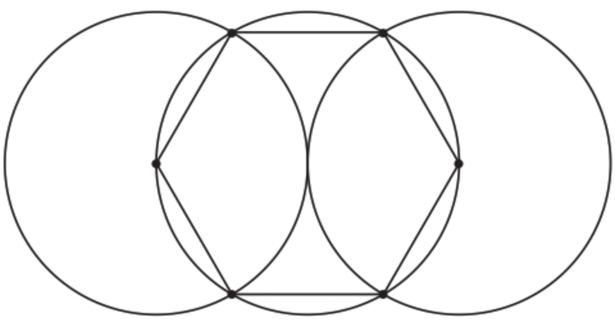


Let's try another one. Draw two circles as before. Extend the line to the right till it meets the circle on the right. With this point as centre, draw another circle of the same radius.

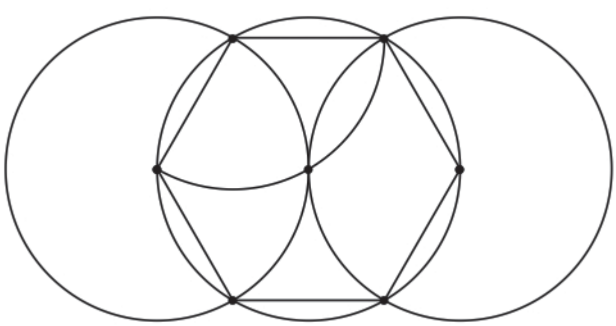


You can erase the first line now.

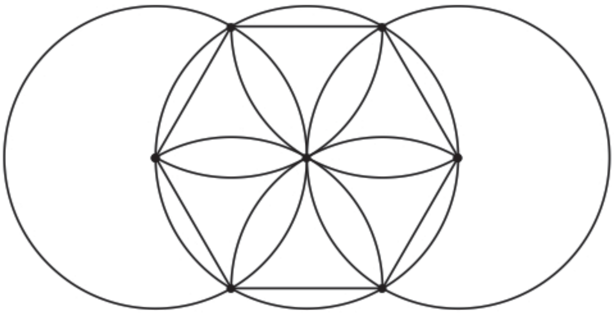
Do you see four points where the circle in the middle is cut by the other two? Joining all these points gives a picture like this.



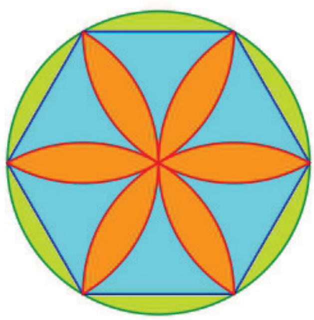
With one of the six points on the middle circle as centre and without changing the radius used till now, draw a piece of a circle within the middle circle, as given below.



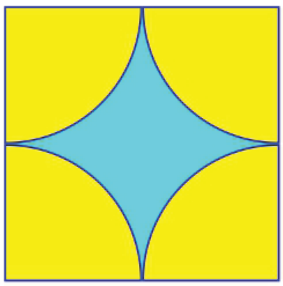
Take three more points as centres and draw pieces of circle like this. (If you find that difficult, draw full circles and later erase the pieces outside the middle circle)

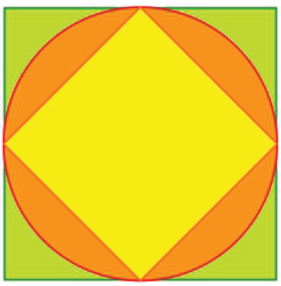


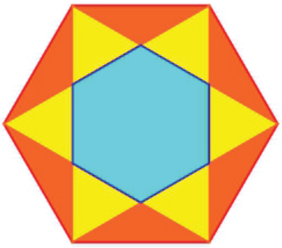
Now you can erase the parts outside the middle circle and colour the picture like this.



Try drawing the pictures below.







2

NUMBER WORLD

Number that Counts

You've learnt many things about numbers. Which is the largest number you know?

Aren't there numbers after that?

It is easy to start from the smallest number and make it bigger and bigger. See.

1	One
10	Ten
100	Hundred
1000	Thousand
10000	Ten thousand

How do the numbers become larger as we write like this?

Every time the digit 1 shifts one place to the left, it becomes ten times as large:

Ten Thousand	Thousand	Hundred	Ten	One
				1
			1	0
		1	0	0
	1	0	0	0
1	0	0	0	0

So can't we shift 1 still further left and make larger numbers?

Sure we can:

100000	Lakh
1000000	Ten lakh
10000000	Crore

Crore	Ten Lakh	Lakh	Ten Thousand	Thousand	Hundred	Ten	One
		1	0	0	0	0	0
	1	0	0	0	0	0	0
1	0	0	0	0	0	0	0

Adding more zeros, we can continue like ten crores, hundred crores and so on.

In other countries these numbers are known by different names.

100000	Hundred thousand
1000000	Million
10000000	Ten million
100000000	Hundred million
1000000000	Billion

It goes like ten billion and hundred billion and thousand billion is called trillion. Why do we need such big numbers?

Do you know how many people are there in our Kerala?

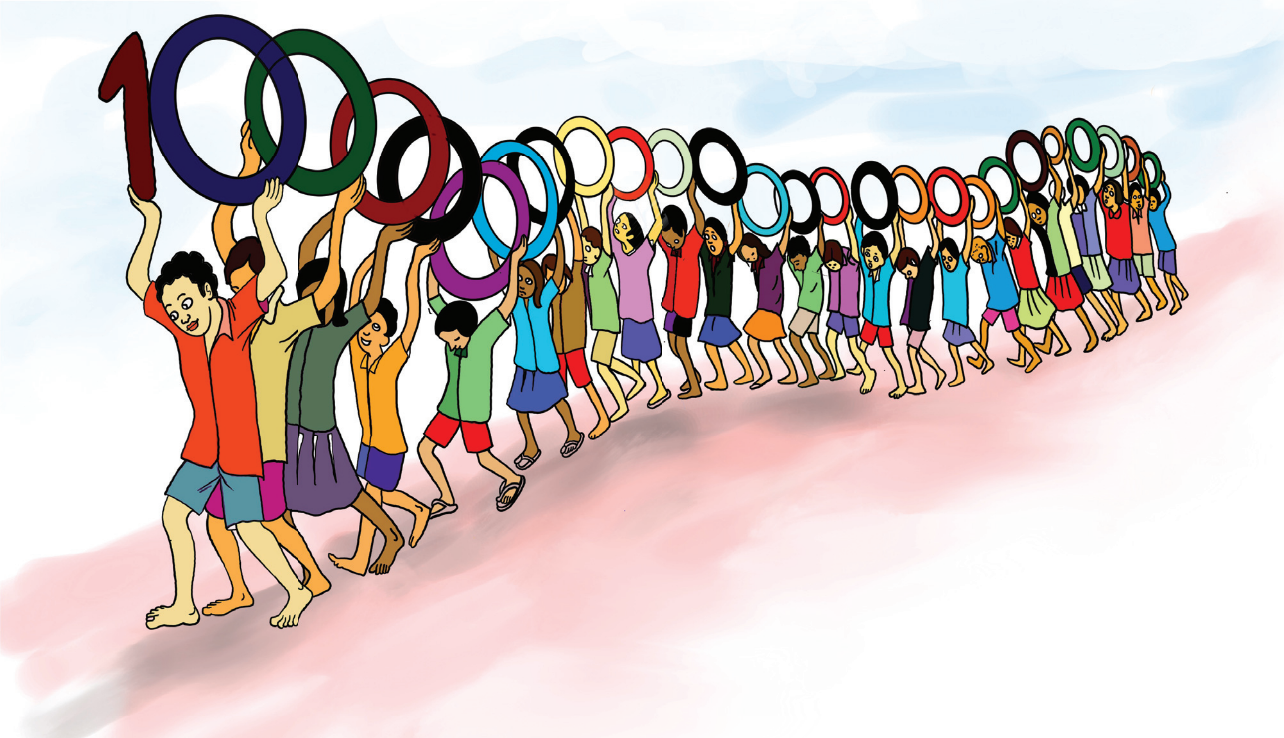
According to the 2011 census, there are about three crore and forty lakhs. In other words, about 34 million.

What about the total population of India?

Child among numbers

Edward Kasner was a mathematics teacher in the USA. He once asked his nine year old nephew Milton, what he would call the number with hundred zeros after one to perk his interest. Milton said, "Googol". Kasner popularized this name in his book, 'Mathematics and the Imagination'. The name "Google" for the internet search engine was inspired by the name of this number

It is more than hundred crores, otherwise, more than a billion. And what about the whole world?



It is about eight hundred crores, that is, eight billion.

The numbers which has only zeros after digit 1 are named like these. What about the other types of numbers?

Reading numbers

There's another way to read 362880. Start from the right with 0 and count places to the left as one, ten, hundred and so on:

0	One
8	Ten
8	Hundred
2	Thousand
6	Ten thousand
3	Lakh

Then the number can be read as "Three lakh, sixty two thousand eight hundred eighty".

For example, the number obtained by multiplying all one- digit numbers from one to nine is 362880 (You can check this, if you have the patience. You can also see how the products increase as you go on multiplying by the succeeding numbers one by one)

How do we read this?

We can start from the left:

3	Three
36	Thirty six
362	Three hundred sixty two
3628	Three thousand six hundred twenty eight
36288	Thirty six thousand two hundred eighty eight
362880	Three lakh sixty two thousand eight hundred eighty

Lakh	Ten Thousand	Thousand	Hundred	Ten	One
					3
				3	6
			3	6	2
		3	6	2	8
	3	6	2	8	8
3	6	2	8	8	0

We can also read numbers by counting digits:

One-digit numbers	1 to 9
Two-digit numbers	10 to 99
Three-digit numbers	100 to 999
Four-digit numbers	1000 to 9999
Five-digit numbers	10000 to 99999
Six-digit numbers	100000 to 999999
Seven-digit numbers	1000000 to 9999999

And we can continue

So how do we read 234567 ? Since it is a six-digit number, it is more than a lakh

Thus we read

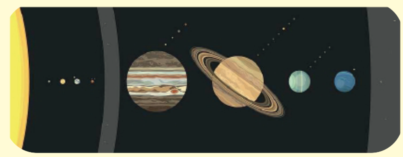
Two lakh ....

....

Can you read the statements below?

Planet distance

The table shows the minimum and maximum distance of the planets from the Sun, as they orbit around it.



Planet	Distance (Km)	
	Minimum	Maximum
Mercury	46375340	70310999
Venus	107710467	109206446
Earth	146605913	152589828
Mars	206445062	249828444
Jupiter	746509460	815308395
Saturn	1347876815	1506450558
Uranus	2734649076	3005421222
Neptune	4458016547	4535807440

1. In 2023, the minimum distance between the Earth and the Moon is 356569 kilometres and the maximum is 406458 kilometres.
2. According to the 2011 census, the population of Kerala was 33406061 and the total population of India was 1210854977.
3. The product of all the numbers from 1 to 11 is 39916800.

Growing numbers

There are only nine one-digit numbers, 1, 2, 3, ..., 9.

How many two-digit numbers are there?

That is, numbers from 10 to 99

Is it 99 – 10 = 89 ?

Let's think:

- There are 99 numbers from 1 to 99
- We have to remove the one-digit numbers 1 to 9 from these

- So 99 – 9 = 90 numbers.

Like this, can't we calculate how many three-digit numbers are there? From the numbers 1 to 999 we have to remove those from 1 to 99

$$999 - 99 = 900$$

Let's look at another problem.

First a simple question: how many two-digit numbers are there having both the digits 1 and 3 ? Just 13 and 31, right?

Okay! How many three-digit numbers have the three digits 1, 3, 5 ?

Don't start counting yet! Let's think a bit (Thinking before doing is the math motto)

We have seen how many two-digit numbers combining 1 and 3. How can we attach 5 to 1 and 3 to make maximum three-digit numbers?

For example let's consider 13

When 5 is placed infront of 1 and 3, we get 5 1 3

When 5 is placed between 1 and 3, we get 1 5 3

When 5 is placed after 1 and 3, we get 1 3 5

Like this, we can attach 5 into 31 also in three different ways:

When 5 is placed before 3 and 1, we get 5 3 1

When 5 is placed between 3 and 1, we get 3 5 1

When 5 is placed after 3 and 1, we get 3 1 5

Altogether we can make 6 three-digit numbers using 1, 3 and 5.

So how many four-digit numbers are possible with 1, 3, 5, 7 as the digits? How do we think about this?

- How many three-digit numbers with digits 1, 3, 5 ?
- In each, what are the different positions where we can attach 7 ?
- How many numbers do you get?

If you got the answer as $4 \times 6 = 24$, your reasoning is correct.

If you have got a different answer you've to rethink the method you have used to find the three-digits and re-read the questions. Now can't you find how many four-digit numbers are there with digits 1, 3, 4, 5 ?

How many nine-digit numbers are possible using digits 1 to 9 ?

Once you've thought about the method, before starting to multiply to calculate the actual number, recall that this product is given somewhere in the first part of this lesson.

Have you noticed that in all these problems, we haven't used the digit 0 ? Why?

For example, how do we compute the number of three-digit numbers with digits 0, 1, 3 ? What changes should you make in the earlier calculations using 1, 3, 5 ?

0 cannot be the first digit.

So in each of 13 and 31, we can attach 0 only at two positions. So, the number of two-digit numbers is $2 \times 2 = 4$.

How many four-digit numbers are possible using all the digits 0, 1, 3, 5 ?

- 6 three-digit numbers are possible with digits 1, 3, 5.
- 0 can be attached at three different positions in each.
- Altogether $3 \times 6 = 18$.

Sum and product

Two lists of numbers to be added:

$$\begin{array}{r} 100000000\ + \\ 120000000 \\ 123000000 \\ 123400000 \\ 123450000 \\ 123456000 \\ 123456700 \\ 123456780 \\ 123456789 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ + \\ 21 \\ 321 \\ 4321 \\ 54321 \\ 654321 \\ 7654321 \\ 87654321 \\ 987654321 \\ \hline \end{array}$$

Which sum is larger ?

If you note that

$$9 \times 1 = 1 \times 9$$
$$8 \times 2 = 2 \times 8$$
$$7 \times 3 = 3 \times 7$$
$$\dots\dots\dots\dots$$

then you can get the answer without actually adding the numbers

Kaprekar number

Start with any four digits and find the largest and smallest four-digit numbers using all these. For example, if we take

2, 3, 5, 6

Largest number 6532

Smallest number 2356

Their difference

$$6532 - 2356 = 4176$$

Now if we repeat the procedure with the digits of this difference, we get

$$7641 - 1467 = 6174$$

What happens if we repeat procedure with the digits of 6174 ?

Take any other four digits and check. Do you get 6174 after some steps?

This was discovered by the Indian mathematician Kaprekar, who was a school teacher in Maharashtra. So this number, 6174 is known as Kaprekar number.

We can think in other ways too:

- There are 24 four-digit numbers with 1, 3, 5, 7 as the digits
- 7 is the first digit in 6 of them
- If we take 0 instead of 7, these 6 numbers have no counterparts
- So there are 24 – 6 = 18 numbers

Now try these:

1. How many two-digit numbers are there with 0 ? How many without 0 ?

2. i. How many three-digit numbers are possible with two 0 ?

ii. How many three-digit numbers are there with only one 0 ?

iii. How many three-digit numbers are there without any zero?

3. How many two-digit numbers are there with the same digit repeated? How many three- digit numbers with the same digit repeated thrice?

4. There are some numbers which read the same when the digits are put in the reverse order. For example, 46764. Such numbers are called palindromic numbers.

i. How many two-digit numbers are palindromes?

ii. How many three-digit numbers?

iii. Four-digit numbers?

5. How many four-digit numbers can be made using all the digits 1, 2, 3, 4 ? What is the sum of all these?

3

Multiplication Methods

Product difference

You know how to add and multiply numbers, don't you?

Here's a simple question:

How much is 15 + 8 ?

And 18 + 5 ?

Next try multiplication:

How much is 15 × 8 ?

And 18 × 5 ?

Why do we get the same answer on adding?

Now let's try as follows:

$$15 + 8 = 10 + 5 + 8$$

$$18 + 5 = 10 + 8 + 5$$

Eight added to five and five added to eight both give thirteen, right?

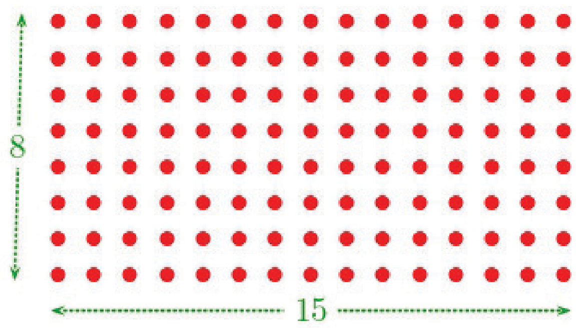
What about multiplication?

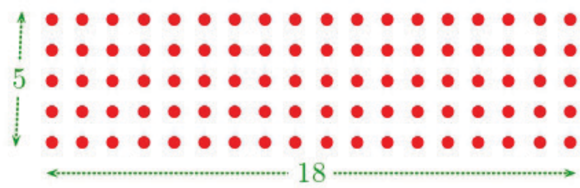
$$15 \times 8 = (10 + 5) \times 8 = (10 \times 8) + (5 \times 8)$$

$$18 \times 5 = (10 + 8) \times 5 = (10 \times 5) + (8 \times 5)$$

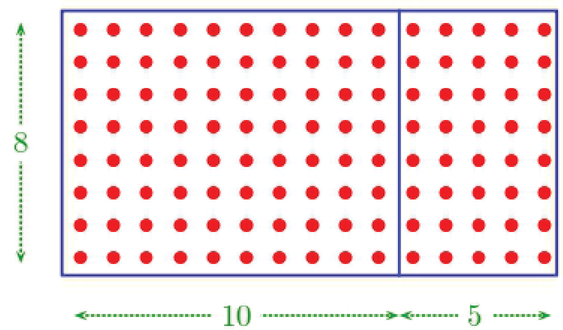
Here also five times eight and eight times five give the same product, forty. But the remaining products are different.

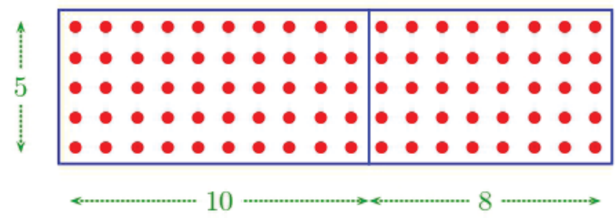
We can see this by drawing pictures also:





In each picture, let's mark off rows of ten dots:





Now in both pictures, the right blocks have 40 dots

But the left blocks have 80 and 50, right?

By looking at the products like this, we also see some other things:

- 15×8 is larger than 18×5
- $80 - 50 = 30$ more

So, can we say which of 16×9 or 19×6 is larger, without multiplying?

How do we think about this?

$$16 \times 9 = (10 + 6) \times 9 = (10 \times 9) + (6 \times 9)$$

$$19 \times 6 = (10 + 9) \times 6 = (10 \times 6) + (9 \times 6)$$

Which is larger? How much more?

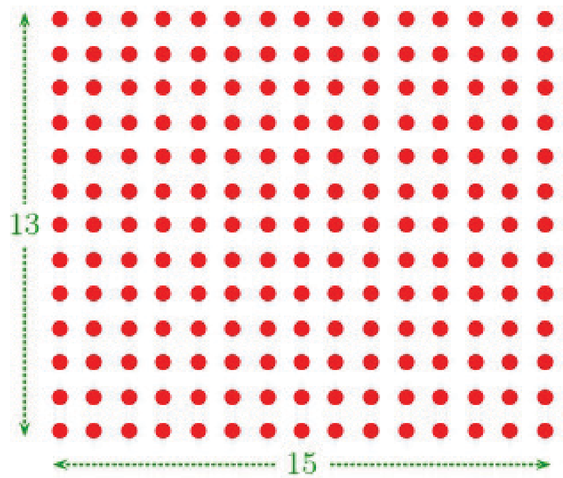
Now in each of the pairs of products given below, can you figure out in your head which is larger and how much more?

(1) 12×8 ; 18×2 (2) 17×6 ; 16×7

(3) 13×9 ; 19×3 (4) 25×6 ; 26×5

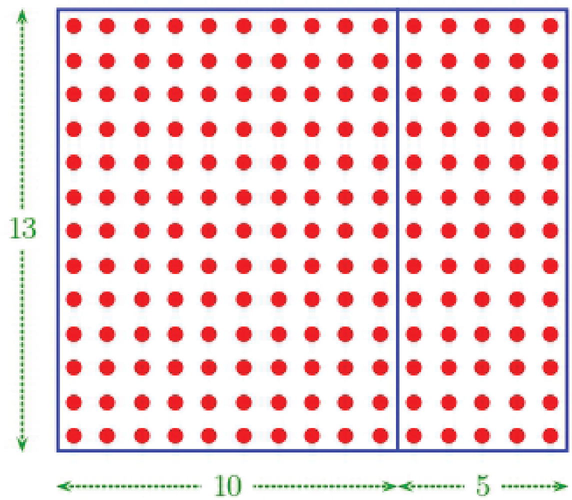
Rectangle multiplication

How many dots are there in this picture?



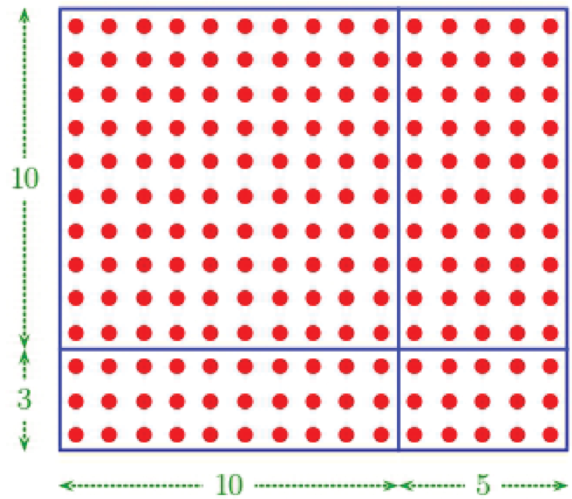
13 rows, each of 15 dots; 15 × 13 dots in all.

To compute this, first let's split each row into 10 and 5 dots:

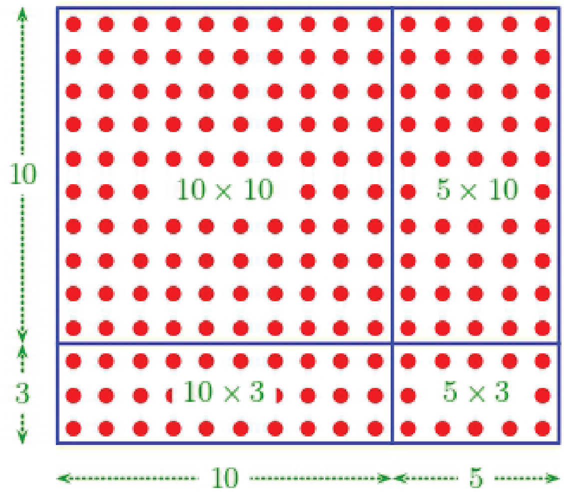


Now the left block has 10 × 13 dots and the right, 5 × 13.

To make the calculations still more simple, let's split each column into 10 and 3.



Now we can easily compute the number of dots in each of the four blocks separately:



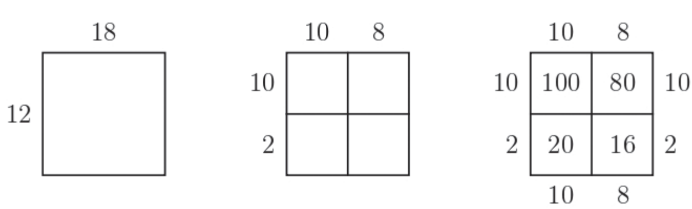
Thus we can calculate

$$15 \times 13 = (10 \times 10) + (5 \times 10) + (10 \times 3) + (5 \times 3)$$
$$= 100 + 50 + 30 + 15$$
$$= 195$$

Now can't you calculate such products without drawing dots?

For example, let's do 18×12

We can do the computation like this:



$100 + 20 + 80 + 16$
$= 216$

Short version

We can also write 18 × 12 like this :

	8	10	
2	16	20	36
10	80	100	180
			216

Some of these calculations can be done in the head and the whole multiplication can be written in this shortened form:

$$\begin{array}{r} 18\ \times \\ 12 \\ \hline 36 \\ 180 \\ \hline 216 \end{array}$$

If the numbers to be multiplied are written only on the top and the left side, the sum of each row can be written on the right and then add them to get the final product:

	10	8	
10	100	80	180
2	20	16	36

	10	8	
10	100	80	180
2	20	16	36
			216

Now try computing the products below like this:

i. 13 × 15   *ii.* 17 × 16   *iii.* 18 × 19   *iv.* 14 × 18   *v.* 15 × 15

We can also compute different products like this. For example, let's try 24 × 17:

	20	4
10	200	40
7	140	28

	20	4	
10	200	40	240
7	140	28	168
			408

What about 35 × 29 ?

	30	5	
20	600	100	700
9	270	45	315
			1015

How about 345 × 26 ?

We will have to draw more cells:

	300	40	5
20			
6			

	300	40	5
20	6000	800	100
6	1800	240	30

	300	40	5	
20	6000	800	100	6900
6	1800	240	30	2070
				8970

Now try these problems on your own:

1. Compute the products below:
   i. 12 × 34 *ii.* 23 × 45
   iii. 75 × 75 *iv.* 123 × 45
   v. 320 × 78
2. Given that 36 × 15 = 540; compute the following products in your head:
   i. 36 × 16 *ii.* 37 × 15
   iii. 36 × 14 *iv.* 35 × 15
3. A number multiplied by 16 gave 1360.
   i. What will be the product, if the next number is multiplied by 16 ?
   ii. What will be the product if the number just before this is multiplied by 16 ?

Stacked products

We can write calculations for 345 × 26 like this:

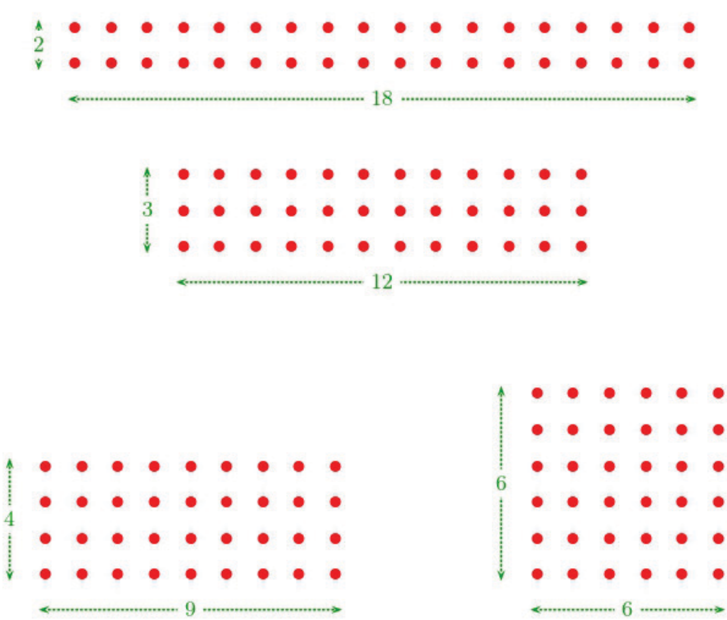
	5	40	300	
6	30	240	1800	2070
20	100	800	6000	6900
				8970

We can condense this by first writing the numbers one below another, then do the multiplication in each row above in head, and finally add these intermediate products by writing them one below the other:

$$\begin{array}{r} 345\ \times \\ 26 \\ \hline 2070 \\ 6900 \\ \hline 8970 \end{array}$$

Square numbers

What are the different ways to arrange 36 dots into rectangles?



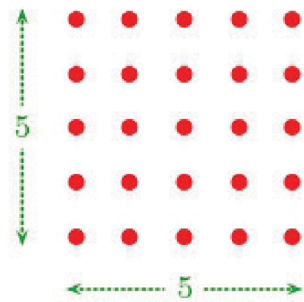
Now we can turn around the first three rectangles. One of them is a special kind of rectangle, isn't it? Can we make a square with any number of dots?

Can we make a square with less than 36 dots?

How many dots are placed in rows and columns to create a square with 36 dots?

Now can't you make a few more squares?

What can you say about the number of dots in a square?



$$36 = 6 \times 6$$

$$25 = 5 \times 5$$

$$16 = 4 \times 4$$

$$9 = 3 \times 3$$

$$4 = 2 \times 2$$

Such numbers are called *square numbers* or simply *squares*.

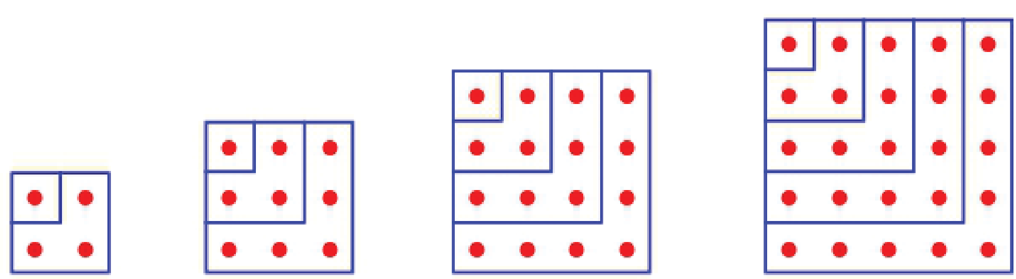
Thus squares are numbers got by multiplying a number with itself.

1 is also included among squares.

You know that $1 = 1 \times 1$.

Which is the next square after 36 ? Which one comes after it?

Now look at the pictures:



$4 = 1 + 3$ $\quad$ $9 = 1 + 3 + 5$ $\quad$ $16 = 1 + 3 + 5 + 7$ $\quad$ $25 = 1 + 3 + 5 + 7 + 9$

Which number is to be added to 25, to get the next square?

To get square 36, how many odd numbers, starting with 1, must be added?

At which position is 36 if squares are ordered 1, 4, 9, ... ?

Odd numbers	1 + 3 + 5 + 7 + ...
	↓ ↓ ↓
Squares	1 4 9 16 ...

Now try these problems:

1. *i.* Calculate 11×11 and 111×111

ii. Can you guess what 1111×1111 would be?

Check whether your guess is correct.

iii. Write the pattern of such products.

2. Look at the following calculations:

$1 + 3 = 4$

$4 + 5 = 9$

$9 + 7 = 16$

Continue this to compute the squares up to 100

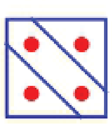
3. *i.* How many odd numbers like 1, 3, 5, are to be added to get 400 ?

ii. Which is the last odd number added in this?

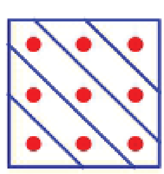
4. *i.* Which is the fiftieth odd number?

ii. What is the sum of the odd numbers from 1 to this number?

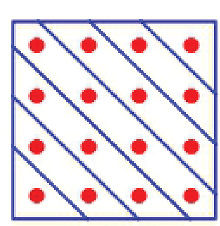
5. Look at these pictures:



$4 = 1 + 2 + 1$



$9 = 1 + 2 + 3 + 2 + 1$



$16 = 1 + 2 + 3 + 4 + 3 + 2 + 1$

i. How do we write 25 as a sum like this?

ii. How about 36 ?

iii. Can you write 100 as such a sum?

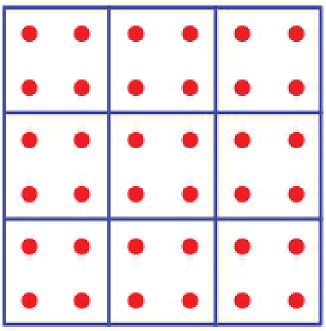
Square product

4 and 9 are squares. What about their product?

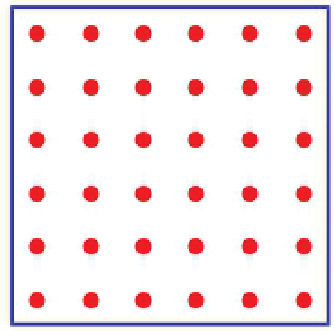
$$4 \times 9 = 36$$

36 also is a square

$$36 = 6 \times 6$$



4×9



6×6

Shall we consider two other squares?

Is 25×16 a square?

Before checking it by actual multiplication, let's think a bit about it:

$$25 = 5 \times 5$$

$$16 = 4 \times 4$$

So,

$$25 \times 16 = 5 \times 5 \times 4 \times 4$$

Changing the order of the numbers to multiply does not affect the product, right? So, we can calculate 25×16 in another way:

$$25 \times 16 = (5 \times 4) \times (5 \times 4) = 20 \times 20$$

Thus we see that 25×16 is also a square.

In the same way, can't we see that the product of any two squares is again a square?

1. Rewrite each of the products below as the product of a number by itself:

i. 9×16 *ii.* 16×36 *iii.* 36×49 *iv.* 49×64 *v.* 81×25

2. Calculate each of the products below in your head:

i. 25×4 *ii.* 25×16 *iii.* 25×36 *iv.* 25×64

4

Division Methods

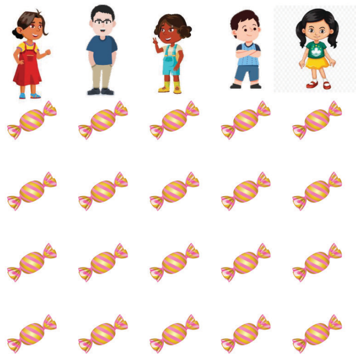
Division and multiplication

How do we distribute 20 pieces of candy equally among 5 kids? We need only 5 candies to give one to each.

If one more is given to each? 

Then $5 \times 2 = 10$ will be used; and there are some pieces left. Even giving one more each will mean $5 \times 3 = 15$ used; still some left.

If we give 4 to each, all the $5 \times 4 = 20$ pieces would be finished.



If we forget about the candy and the kids and think just about the numbers, the question is this:

If 20 is split into 5 equal parts, how much would be each part?

In the language of math, this is shortened further:

What is the number got on dividing 20 by 5 ?

We can shorten this by using math symbol.

What is $20 \div 5$?

How did we find the answer?

If the 5 parts are

- 1 each, then total is 5
- 2 each, then total is two times of 5. $5 \times 2 = 10$.
- 3 each, then total is three times of 5. $5 \times 3 = 15$.
- 4 each, then total is four times of 5. $5 \times 4 = 20$.

So the questions on parts and division above can be rewritten as questions on times and multiplication.

Parts and Division	Times and Multiplication
If 20 is split into 5 equal parts, how much would each part be?	How many times of 5 makes 20 ?
What number do we get on dividing 20 by 5 ?	By what number should 5 be multiplied to get 20 ?
$20 \div 5 = ?$	$5 \times ? = 20$

Now look at this problem:

40 litres of water was filled in 8 bottles of the same size. How many litres of water will there be in each bottle?

This can be written as 'parts' in ordinary language and as 'division' in math language, as follows.

Parts and Division	Times and Multiplication
If 40 is split into 8 equal parts, how much would be each part ?	
What number do we get on dividing 40 by 8 ?	
$40 \div 8 = ?$	

Can you rewrite these in terms of times and multiplication and find the answer?

Another problem:

6 persons equally shared 48 kilograms of rice. How many kilograms did each get?

Write this first as a question on parts and then division, then rewrite in terms of times and multiplication, and find the answer:

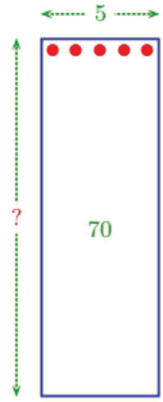
Parts and Division	Times and Multiplication

Rectangle division

Look at this problem:

A rectangle is to be made with 75 dots, 5 dots in each row. How many rows can be made?

After one row is made, 70 dots are left:



When one more row is added, 65 dots are left.

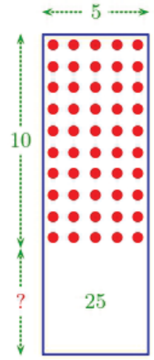
Instead of placing rows one by one and checking, why don't we place 10 rows at a time and see how much is left?

How many dots are used then?

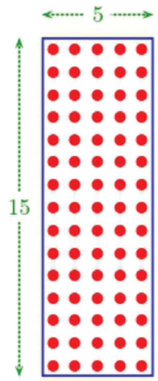
$$5 \times 10 = 50$$

How many more to be placed?

$$75 - 50 = 25$$



How many more rows can be made?



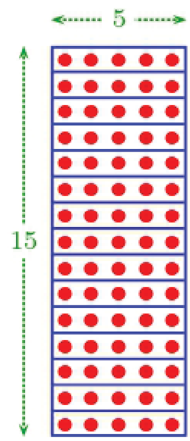
What actually did we compute here?

75 is the 15 times of 5.

That is, $5 \times 15 = 75$

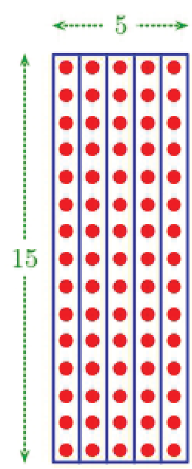
How do we say this in terms of parts?

If 75 is divided into parts of 5, there would be 15 parts:



This can also be stated as follows:

If 75 is divided into 5 equal parts, each part would be 15.



And in terms division?

$$75 \div 5 = 15$$

Money problem

An amount of 96 rupees which comprises of 9 ten rupee notes and 6 one rupee coins needs to be equally divided among 8 persons. How will you do that?

First give one ten rupee note to each. If the remaining note is changed to one rupee coins, then these together with the six already there, will make sixteen coins in all. Two each can be distributed, to the eight persons.

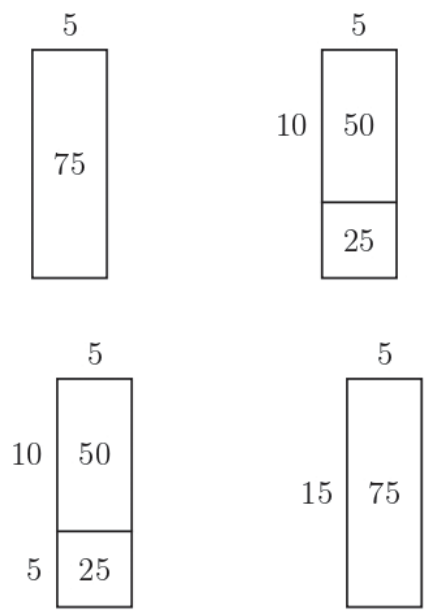
All these calculations can be shown in terms of just numbers, as below:

	1	2
	Ten	One
8	9	6
	8	
		16
		16

This can be further shortened like this:

$$\begin{array}{r|l} & 12 \\ \hline 8 & 96 \\ & 8 \\ \hline & 16 \\ & 16 \\ \hline & 0 \end{array}$$

Let's write our method of computation without drawing dots and using only numbers:



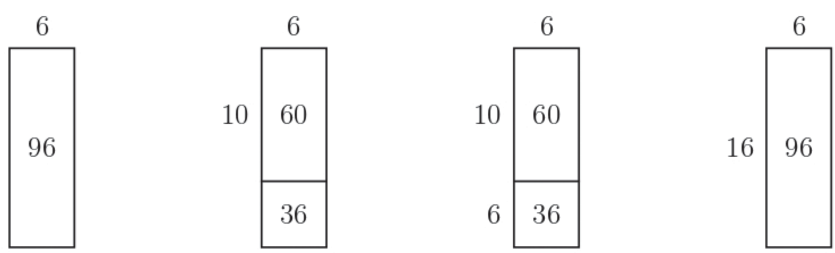
Another problem:

A rectangle is to be made with 96 dots, 6 dots in each row. How many rows can be made?

We can think like this

- 10 rows would use up 60 dots; 36 left
- Since $6 \times 6 = 36$, we can have 6 more rows
- Altogether, $10 + 6 = 16$ rows

We can draw boxes and write the calculations like this:



We can just draw one box and do the calculations one by one within that:

$$\begin{array}{|c|} \multicolumn{1}{c}{6} \\ \hline 96 \end{array} \qquad \begin{array}{r|l|l} & \multicolumn{1}{c}{6} & \\ \cline{2-2} & 96- & \\ 10 & 60 & 6 \times 10 = 60 \\ \cline{2-2} & 36 & \end{array} \qquad \begin{array}{r|l|l} & \multicolumn{1}{c}{6} & \\ \cline{2-2} & 96- & \\ 10 & 60 & 6 \times 10 = 60 \\ \cline{2-2} & 36- & \\ 6 & 36 & 6 \times 6 = 36 \\ \hline 96 \div 6 = 16 & 0 & 6 \times 16 = 96 \\ \cline{2-2} \end{array}$$

At the end, if you don't remember $36 = 6 \times 6$, you can do like this:

$$\begin{array}{r|l|l} & \multicolumn{1}{c}{6} & \\ \cline{2-2} & 96- & \\ 10 & 60 & 6 \times 10 = 60 \\ \cline{2-2} & 36- & \\ 5 & 30 & 6 \times 5 = 30 \\ \cline{2-2} & 6- & \\ 1 & 6 & 6 \times 1 = 6 \\ \hline 96 \div 6 = 16 & 0 & 6 \times 16 = 96 \\ \cline{2-2} \end{array}$$

Here's another problem:

If 192 rupees is shared equally between 8 persons, how much will each get?

How do we think about this?

- If each takes 10 rupees, that makes 80 rupees;

  $192 - 80 = 112$ rupees. Here 112 rupees is remaining.
- If another 10 rupees is given to each of them, 32 rupees will remain.

  $112 - 80 = 32$ rupees.

  * If each takes 1 more rupee, only 8 rupees is taken.
  * 2 rupees each means only 16 rupees is taken.
  * 3 rupees each means 24 rupees is taken.
  * 4 rupees each means the entire 32 rupees are used up.

Each gets $10 + 10 + 4 = 24$ rupees.

Another money problem

We can think about the problem of dividing 1 hundred rupee note, 9 ten rupee notes and 2 one rupee coins equally among 8 persons, in a slightly different way.

So, in all, the hundred rupee note changed into 10 ten rupee notes and the 9 ten rupee notes would make 19 ten rupee notes. If 2 of these are given to each, 3 notes would be left. If these are changed to one rupee coins, then together with the 2 coins already in hand, there will be 32 coins. These remaining 32 coins can be shared by giving 4 to each.

All these computations can be condensed as before:

		2	4
	Hundred	Ten	One
8	1	9	2
		19 16	2
		3	2
			32 32
			0

This can be compressed further into this:

$$\begin{array}{r|l} & 24 \\ \hline 8 & 192 \\ & \underline{16} \\ & \ \ 32 \\ & \ \ \underline{32} \\ & \ \ \ \ 0 \end{array}$$

We can write these steps like this:

	8	
	192–	
10	80	$8 \times 10 = 80$
	112–	
10	80	$8 \times 10 = 80$
	32–	
4	32	$8 \times 4 = 32$
$192 \div 8 = 24$	0	$8 \times 24 = 192$

While doing it, if we recall $8 \times 2 = 16$ and $8 \times 20 = 160$, we can reduce the number of steps:

	8	
	192–	
20	160	$8 \times 20 = 160$
	32–	
4	32	$8 \times 4 = 32$
$192 \div 8 = 24$	0	$8 \times 24 = 192$

Let's try changing the numbers in the same problem.

If 3000 rupees is shared equally among 12 persons, how much will each get?

If as before, we think of each person taking 10 rupees, 20 rupees and so on, the total amount would be reduced by 120 rupees, 240 rupees and so on. But these numbers are much smaller than the total 3000.

Let's consider each of them taking 100 rupees, 200 rupees and so on.

The total would then be reduced by 1200 rupees, 2400 rupees and so on.

So, let's start like this:

	12	
	3000–	
200	2400	$12 \times 200 = 2400$
	600	

Now there's no enough money for each of them to take 100 rupees more.

If this amount is shared as 10 rupees, 20 rupees and so on, it would be reduced by 120 rupees, 240 rupees and so on, as seen before.

How much money should each of them take for 600 rupees to be used up?

So, let's write as follows:

	12	
	3000–	
200	2400	$12 \times 200 = 2400$
	600–	
50	600	$12 \times 50 = 600$
$3000 \div 12 = 250$	0	$12 \times 250 = 3000$

Here, if it's difficult to see $12 \times 50 = 600$, you can repeatedly subtract 120 till all of 600 is used up.

Or, subtract 240 two times and 120 once:

	12	
	3000–	
200	2400	$12 \times 200 = 2400$
	600–	
20	240	$12 \times 20 = 240$
	360–	
20	240	$12 \times 20 = 240$
	120–	
10	120	$12 \times 10 = 120$
$3000 \div 12 = 250$	0	$12 \times 250 = 3000$

Now let's try these:

1. Total price of 7 pens of equal rate is 98 rupees. What's the price of a pen?
2. If 168 rupees is shared equally among 8 persons, how much will each get?
3. The school store needs 1825 notebooks. How many packs of 25 notebooks, are to be bought?

Remainders

A small problem:

How can 20 pens be packed into packets of 5 ?

How did you find the answer?

You have seen how this can be written in two ways:

$$20 \div 5 = 4$$

$$5 \times 4 = 20$$

How can 21 pens be packed into packets of 5 ?

There will be 4 packets and one pen left over.

In the language of math, we say it like this

21 divided by 5 gives quotient 4 and remainder 1

In this, the quotient shows the number of parts, with 5 in each, into which we can split 21 and the remainder is the number left over.

This we can write in terms of multiplication also:

$$21 = (5 \times 4) + 1$$

Like this,

$$22 = (5 \times 4) + 2$$

$$23 = (5 \times 4) + 3$$

$$24 = (5 \times 4) + 4$$

Can we write other numbers also as so many times 5 and a remainder?

What about 20 ?

$$20 = (5 \times 4) + 0$$

This means, 20 divided by 5 gives quotient 4 and remainder 0

Can we write numbers less than 5 like this ?

For example, if we take 4,

$$4 = (5 \times 0) + 4$$

That is, 4 divided by 5 gives quotient 0, remainder 4 itself.

Thus any number can be written as so many times 5 and a remainder; and the remainder in all cases will be one of the numbers 0, 1, 2, 3 or 4.

What about numbers other than 5 ?

Let's take 4:

$0 = (4 \times 0) + 0$	$4 = (4 \times 1) + 0$	$8 = (4 \times 2) + 0$
$1 = (4 \times 0) + 1$	$5 = (4 \times 1) + 1$	$9 = (4 \times 2) + 1$
$2 = (4 \times 0) + 2$	$6 = (4 \times 1) + 2$	$10 = (4 \times 2) + 2$
$3 = (4 \times 0) + 3$	$7 = (4 \times 1) + 3$	$11 = (4 \times 2) + 3$

We can continue this as much as we wish. For example, taking 135, we have

	4	
	135–	
30	120	$30 \times 4 = 120$
	15–	
3	12	$3 \times 4 = 12$
Times 33	3	$(33 \times 4) + 3 = 135$
	Remainder	

So, any number can be written as so many times a number other than zero, and a remainder; and the remainder will be less than the second number:

Now let's try these problems:

1. What are the numbers which leave remainder 0 on division by 2 ? And those that leave remainder 1 ?

2. What are the possible remainders on dividing a number by 3 ? Write the pattern of numbers leaving the same remainder for each of these.

3. See the way numbers are arranged below:

0	1	2	3	4
5	6	7	8	9
10	11	12	13	14
15	16	17	18	19

i. Is there any relation between the quotients on dividing the numbers in any one row by 5 ? And the remainders?

ii. What if numbers in any one column are divided by 5 ?

iii. What are the first and last numbers of the 10^{th} row?

iv. What is the 4^{th} number in the 12^{th} row?

v. Which column and row does the number 123 belong to?

4. Write each of the numbers as certain times 9 and a remainder

(a) 11 (b) 111 (c) 1111

i. Can you guess how 1111 is written like this? Check your guess by actual division.

ii. Write out this number pattern.

5. Write each of the numbers as certain times 8 and a remainder

(a) 9 (b) 98 (c) 987

i. Can you guess how 9876 is written like this? Check your guess by actual division.

ii. Write out this number pattern.

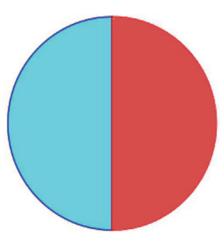
5

Part Number

Half means

After eating two dosas, Mini said, "Just half a dosa more, Ma!"

Look at the picture:



Half of the circle is blue and half of the circle is red.

What about this line?

Again, half of the line is blue and half of the line is red.

And if the length of the line is one metre, we can say half a metre blue and half a metre red.

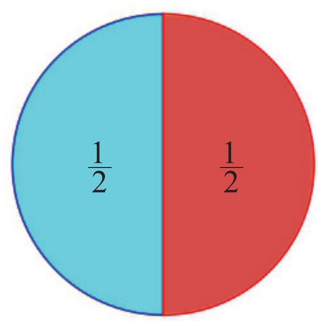
If one litre milk is shared equally between two children, how much does each get?

Half a litre, right?

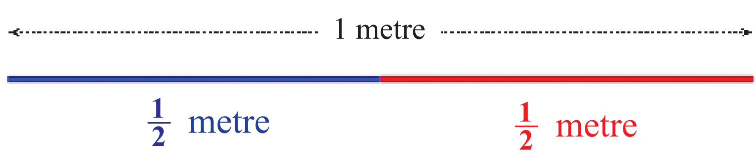
Half means one of two equal parts. We write it as $\frac{1}{2}$.

Thus

- Mini wants $\frac{1}{2}$ of a dosa.
- $\frac{1}{2}$ of the circle is colored blue, $\frac{1}{2}$ red.

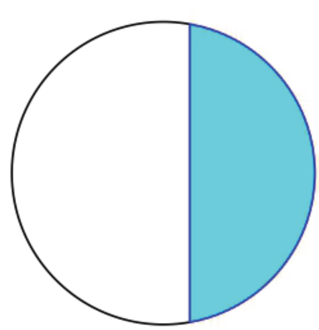


- Half of a metre is $\frac{1}{2}$ metre.



- Half a litre is $\frac{1}{2}$ litre.

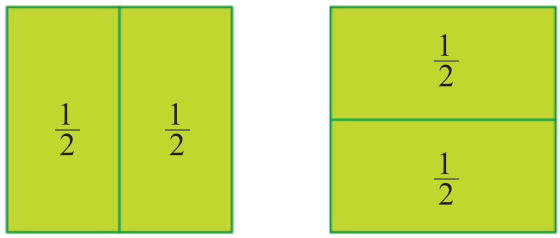
Now look at the picture:



Is the coloured part $\frac{1}{2}$ of the circle?

The parts are not the same, are they?

Look at the pictures:

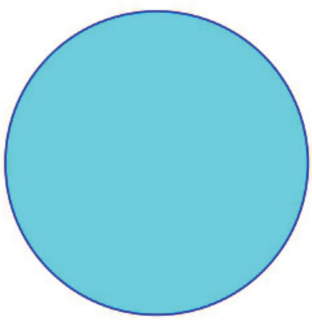


$\frac{1}{2}$ of a square is marked in two different ways.

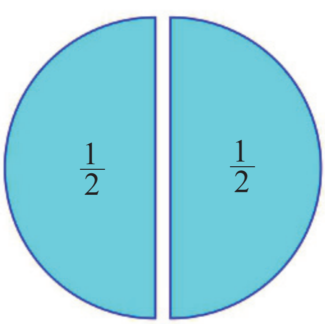
Any other way to split a square into halves? Think about it

Half in many ways

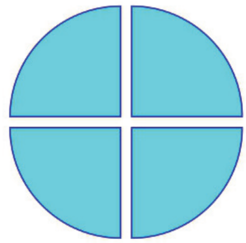
Draw a circle in paper and cut it out:



Folding it right through the middle and cutting makes two halves.

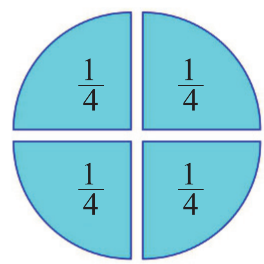


What will we get if we fold and cut each of these pieces through the middle?

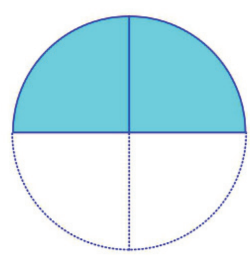


Each of these four little pieces is one of four equal parts of the circle, isn't it?

So, we can call each one fourth of the circle and write $\frac{1}{4}$ of the circle

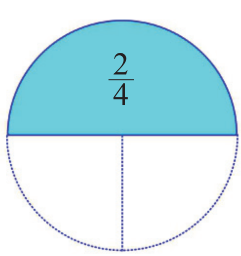


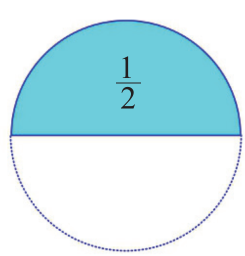
Suppose we join two of them together



It's two of the tour equal parts of the circle, right? So, we can call it two fourths of the circle; and write $\frac{2}{4}$ of the circle.

But it is also $\frac{1}{2}$ of the circle, isn't it?



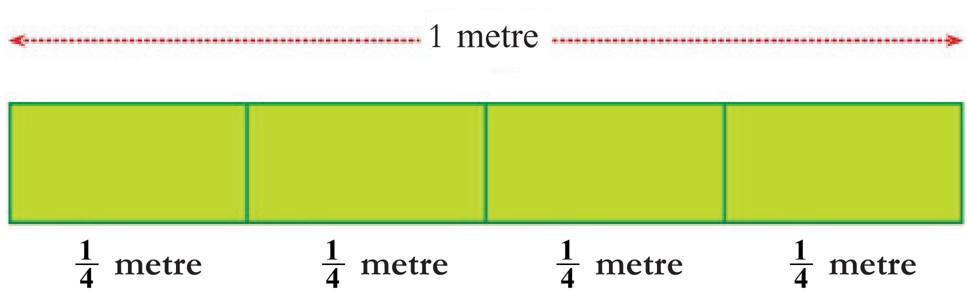


Whether we take two of four equal parts or one of two equal parts, what we get is half; that is to say, two fourth is the same as half. In the language of math.

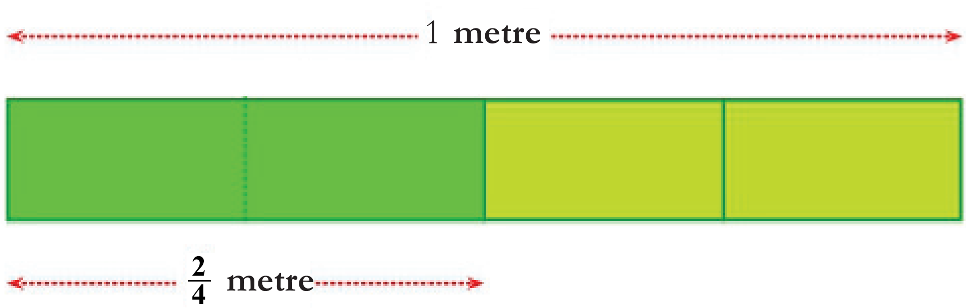
$$\frac{2}{4} = \frac{1}{2}$$

Let's consider another example.

If a one metre long ribbon is cut into four equal pieces, each part is $\frac{1}{4}$ metre long:

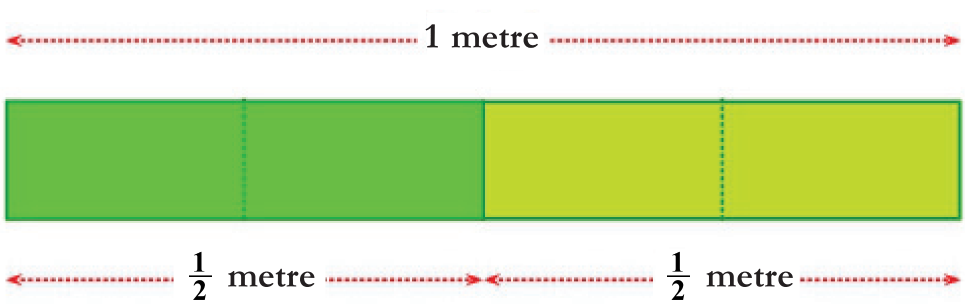


Suppose we take two parts together:



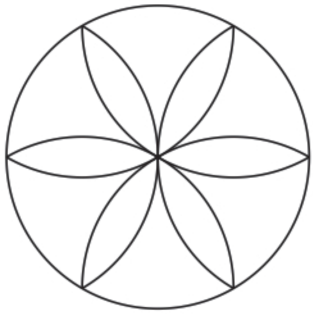
Since it is got by joining 2 of the 4 equal parts into which one metre is cut, we can say it is $\frac{2}{4}$ metre.

Since it is half of 1 metre, it may be better to say $\frac{1}{2}$ metre (and easier to understand also).

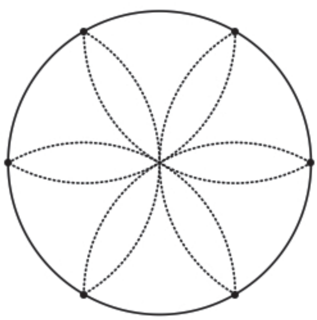


Let's have some more circles.

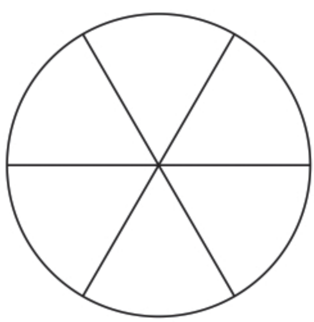
Do you remember this picture from the lesson, Lines and Circles?



We can mark six points on the circle in this:



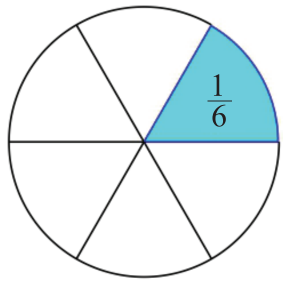
Joining these points to the centre, we get a picture like this:



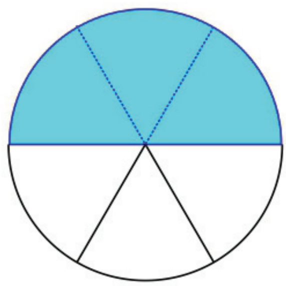
How many parts of the circle do we get?

Are they all of the same size? (If you are not convinced, Draw a picture on a thick sheet of paper, cut out the pieces and check by stacking up the pieces).

We say each piece is one sixth of the circle, and write $\frac{1}{6}$ of the circle.



In the above picture, to colour half the circle, how many more pieces should we colour?



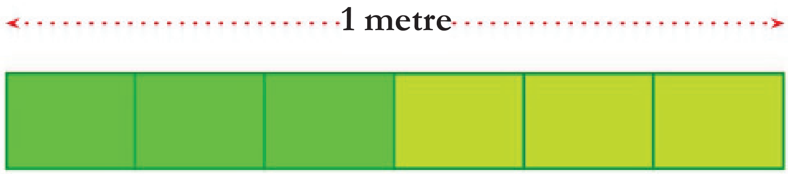
Out of the six equal parts, how many are coloured now? So, what part of the circle can we say is coloured? How do we write it?

How do we write in the language of math that this is half the circle?

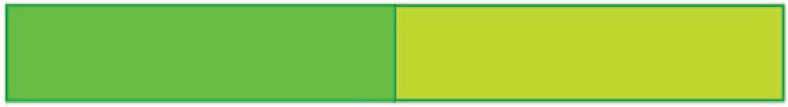
$$\frac{3}{6} = \frac{1}{2}$$

Thus three sixth is also half.

We can also see this by cutting a one metre long ribbon into six equal pieces and joining three of them together:



$\frac{3}{6}$ metre

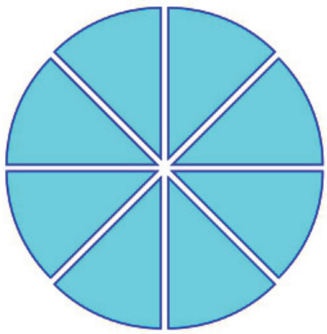


$\frac{1}{2}$ metre

How many pieces will we get if we fold and cut through the middle of the four equal pieces of the circle?

What part of the circle we say each is?

And how do we write it?



How many such pieces must be joined together to get half the circle?

So what's another way of saying half?

How do we write it?

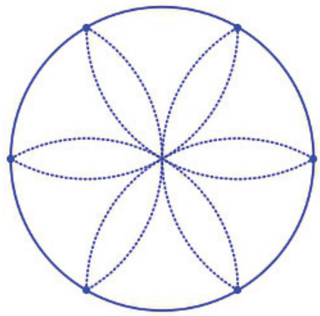
Let's make a table of the different forms of 'half' we've seen:

Half			
Parts cut	**Parts taken**	**Said**	**Written**
2	1	Half	$\frac{1}{2}$
4	2	Two fourths	$\frac{2}{4}$
6			
8			

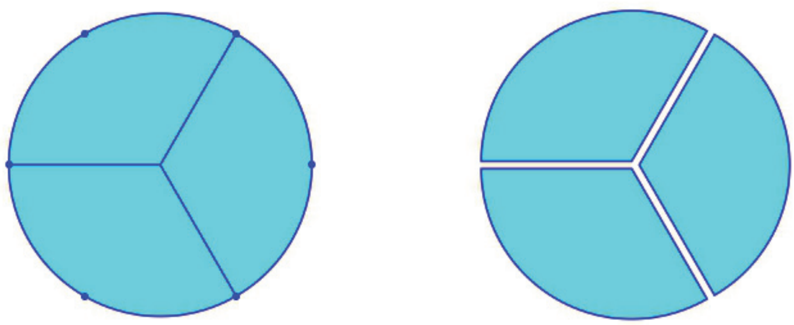
Can't you fill up the empty cells ?

Three parts

Don't you remember marking six points on the circle to cut it into six equal parts?

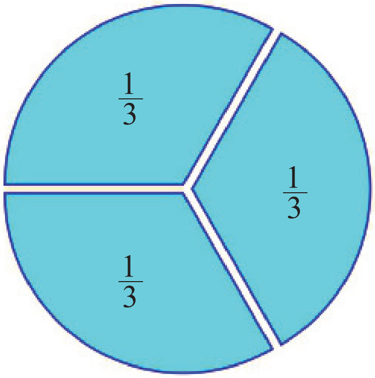


Draw a circle on a thick sheet of paper and mark these six points. Join only the alternate points with the centre. First cut out the circle and then cut along these lines.

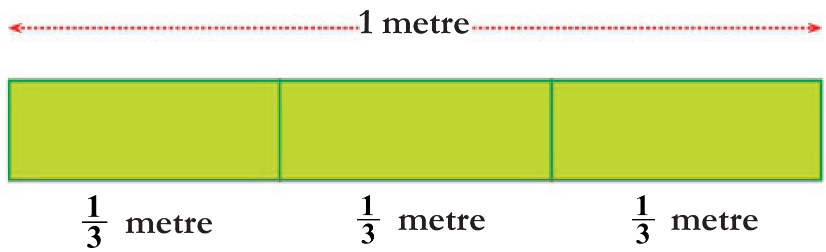


Put these pieces one over another and check. Aren't they all of the same size?

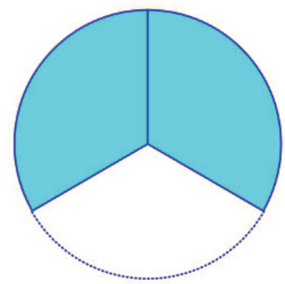
Each piece is said to be one third of the circle; and we write $\frac{1}{3}$ of the circle:



If a 1 metre long ribbon is cut into three equal pieces, the length of each is $\frac{1}{3}$ metre.



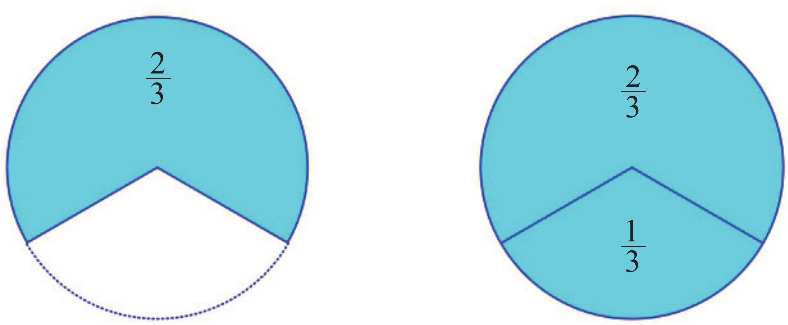
If one litre of milk is shared by three, how much will each get?



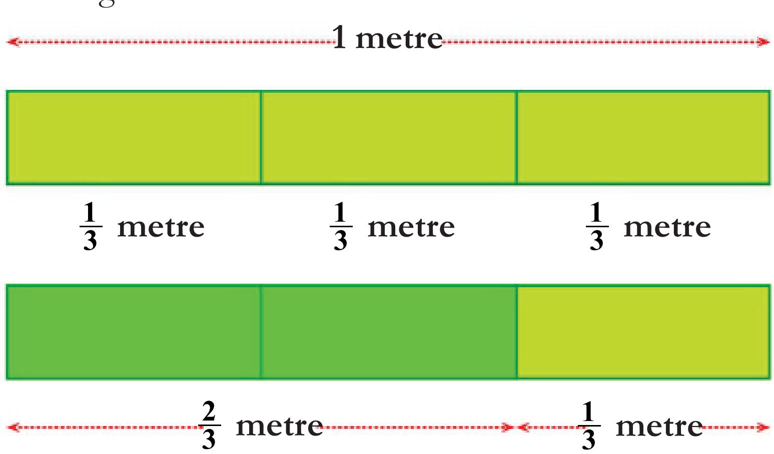
If we put together two of the three equal parts into which a circle is cut, what part of the circle would it make?

It's two of the three equal parts of the circle which has been cut into three.

It is said to be two thirds of the circle, written $\frac{2}{3}$ of the circle.

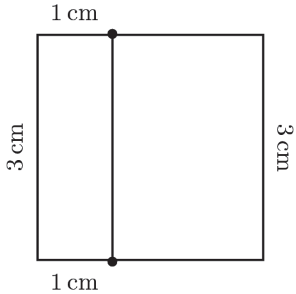


Like this, let's put together two of the three equal pieces into which a one metre long ribbon is cut:



Now let's try these on your own:

1. Draw a square with each side 3 centimetres. Mark off 1 centimeter from the left on the top and bottom sides, and join them.



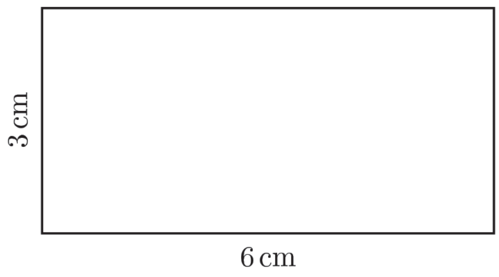
   i. What part of the square is the smaller rectangle?

   ii. And the larger?

   iii. Colour the $\frac{1}{3}$ part with red and the $\frac{2}{3}$ part with green.

   iv. Is there another way of dividing the square into $\frac{1}{3}$ and $\frac{2}{3}$ parts?

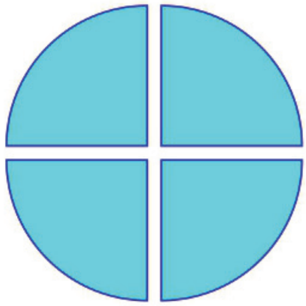
2. Draw a rectangle like this:



Colour $\frac{2}{3}$ of it with green and, $\frac{1}{3}$ with red.

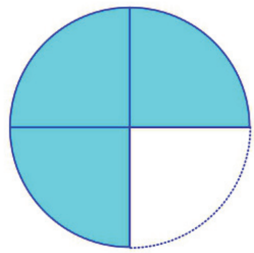
Other parts

We've seen how to divide a circle into four equal parts:

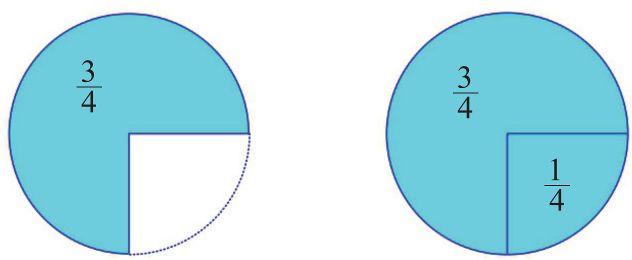


And also that two of the pieces together make half the circle.

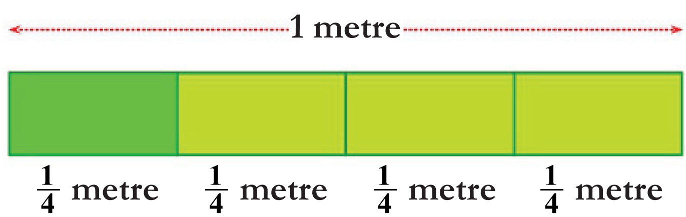
What if we put together three of the pieces?

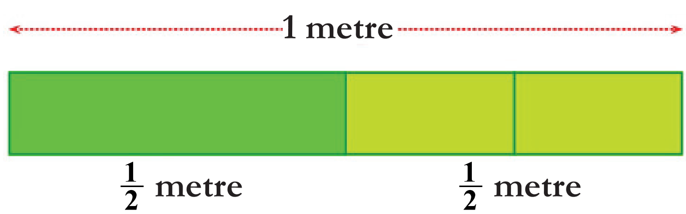


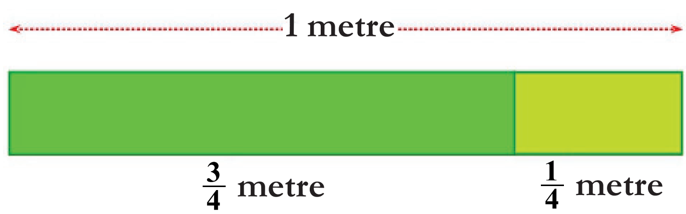
Since it's three of the four equal parts of the circle, we can say it's three fourths of the circle, and write $\frac{3}{4}$ of the circle:



See the different lengths we get by putting together different number of pieces got by dividing a one metre long ribbon into four equal parts:



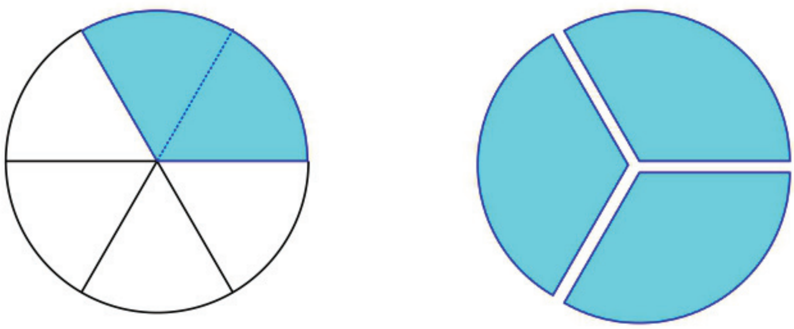




One fourth is usually called a quarter and three fourths, three quarters. So, the lengths in the picture above can be called quarter metre, half metre and three quarters metre.

Another question: if three of the six equal parts into which a circle is divided are coloured, then half the circle is coloured; what if we colour only two parts?

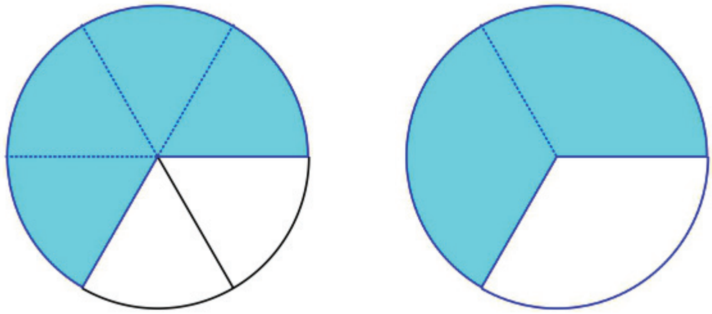
Put on the top of this coloured part, one of the three equal pieces into which the circle is divided and see:



Thus two sixths is the same as one third:

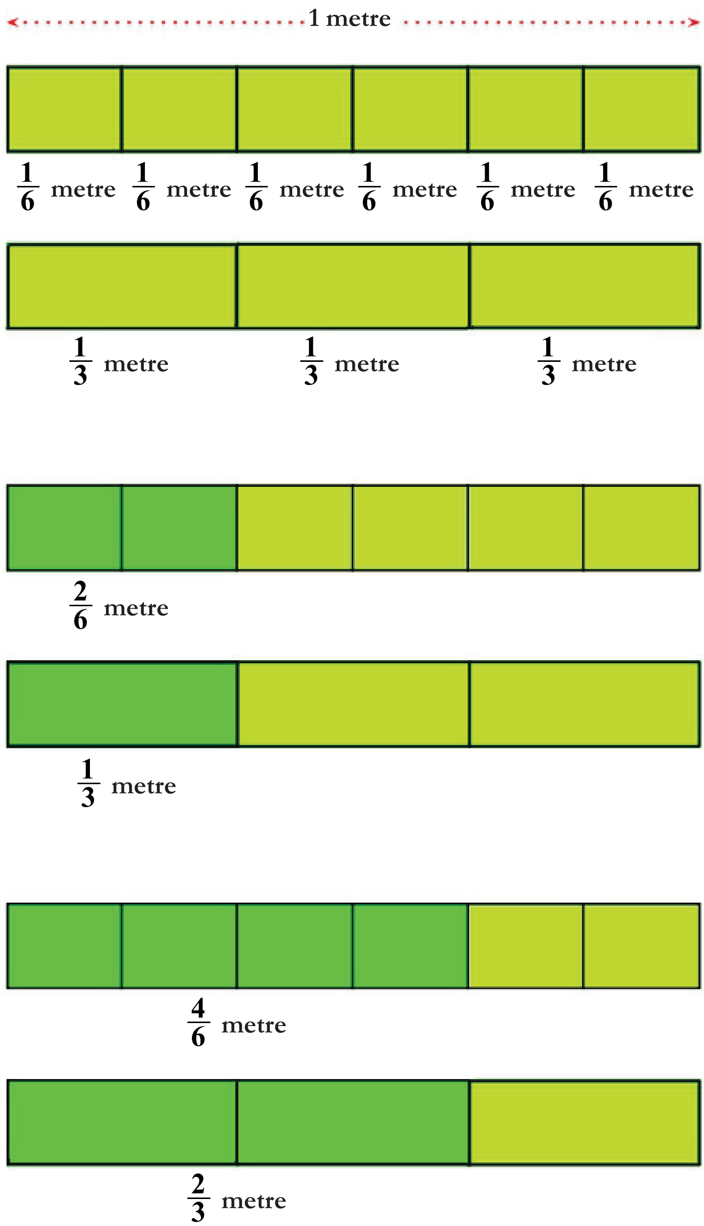
$$\frac{2}{6} = \frac{1}{3}$$

Like this, colour four of these six parts and compare with two of the three equal parts:



$$\frac{4}{6} = \frac{2}{3}$$

We can also join different number of pieces of a one metre ribbon cut into six pieces, and compare them with the pieces of another one metre ribbon cut into three equal parts.



The numbers like $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{3}{4}$, ... used to denote parts of a whole are called fractions.

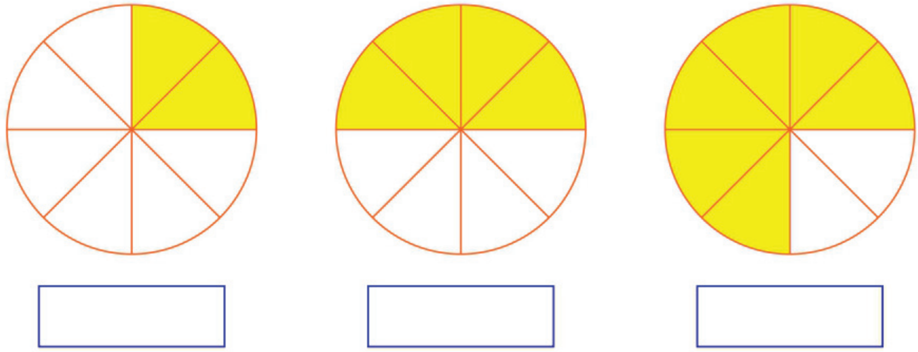
What have you so far learnt about fractions?

- We say half, one third, two third and so on in common language when we divide something into equal parts and take only some of the pieces.

  - One of the two equal parts of a dosa is half a dosa.
  - If one litre of milk is used to fill three bottles of the same size, then each bottle contains one third of a litre
  - If a one metre long ribbon is folded into three equal parts and two of them are cut off together, the length of that piece is two third of a metre
- Fractions are used to talk about these parts in the language of math
  - $\frac{1}{2}$ dosa
  - $\frac{1}{3}$ litre
  - $\frac{2}{3}$ metre
- Fraction in different forms may be the same part:
  - Cut a dosa into four equal pieces and take two pieces; or cut it into two equal pieces and take one piece. In either case we have half a dosa: $\frac{2}{4} = \frac{1}{2}$
  - Fill six bottles of the same size with one litre of milk and take two bottles; or fill three bottles of the same size with one litre of milk and take one bottle. In either case we get one third of a litre: $\frac{2}{6} = \frac{1}{3}$.
  - Fold a one metre long ribbon into six equal parts and cut off four of these parts together; or fold a one metre long ribbon into three equal parts and cut off two of these parts together. In either case we get a piece, which is two third of a metre long: $\frac{4}{6} = \frac{2}{3}$.

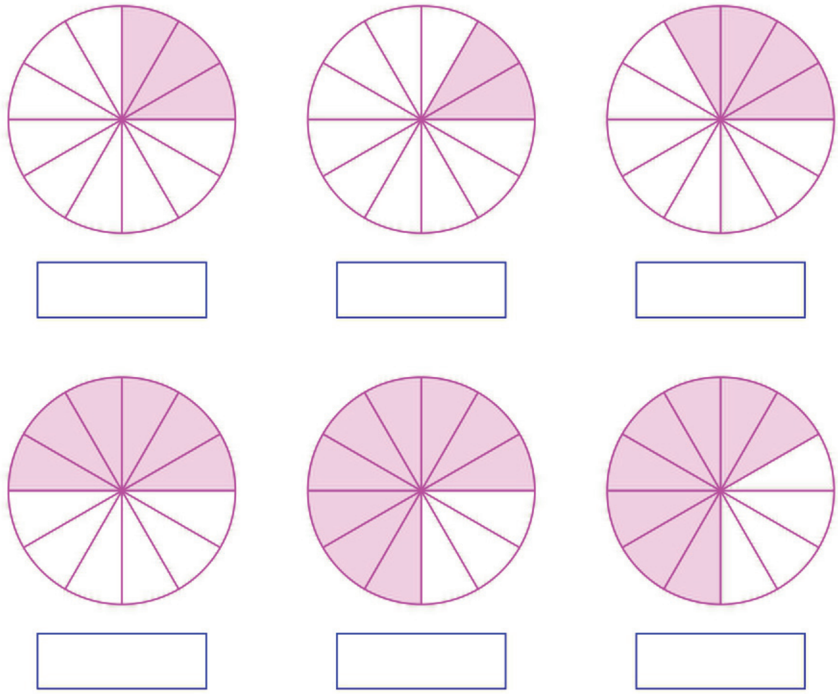
Now let's try these problems.

1. The pictures below show a circle divided into eight equal parts and coloured two at a time:



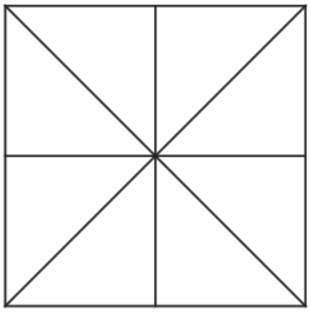
Describe the coloured part of each in two different ways and write both of them as fractions in the box below each picture.

2. The pictures below show circles divided into twelve equal parts with some of the parts coloured:



Describe the coloured part of each in two different ways and write both of them as fractions in the box below each picture

3. Draw a square and divide it as shown below:



Colour $\frac{1}{8}$ of the square with red, $\frac{1}{4}$ with green and $\frac{1}{2}$ with blue.

i. Is there any part left uncoloured?

ii. What part of the whole square is it?

iii. Write it as a fraction.

Whole and part

Haven't you heard people saying one and a half litres of milk, one and a quarter metres of cloth, two and a half kilograms of beans, and so on.

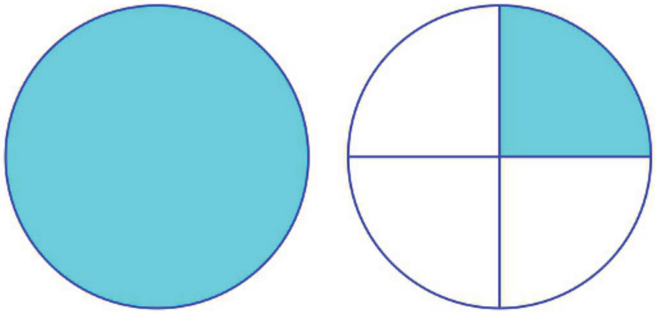
What do these mean?

Suppose one litre of milk is poured into a pot and then half a litre more. How much does it contain now?

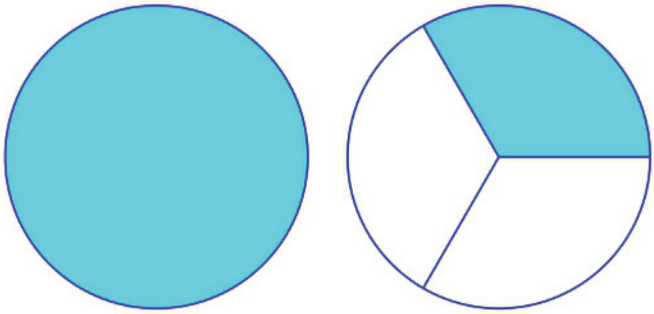
One litre and half a litre together make one and a half litres. We write it as $1\frac{1}{2}$ litres.

If two litres and quarter of a litre are taken together, that make two and a quarter litres, written $2\frac{1}{4}$ litres.

Look at these pictures:

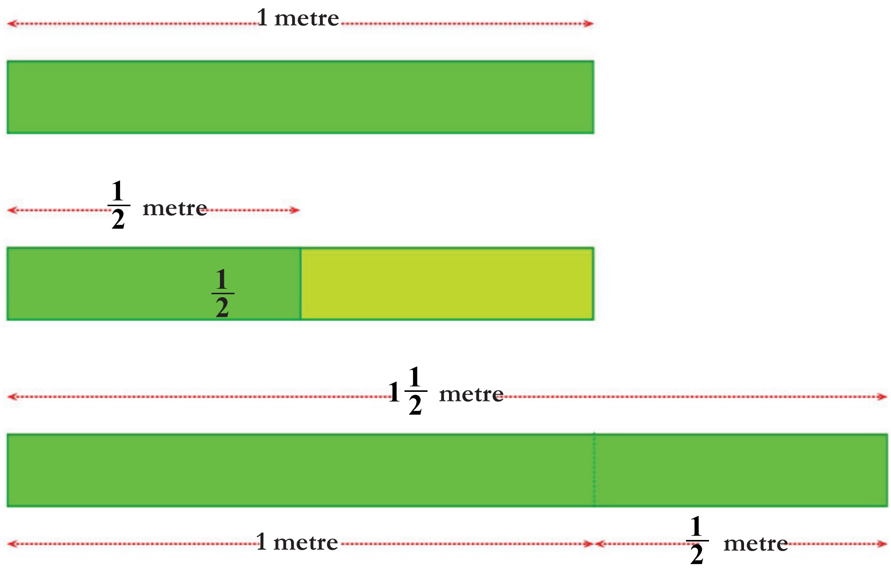


What fraction of the second circle is coloured? So, we can say, $1\frac{1}{4}$ circles are coloured. What about this picture?

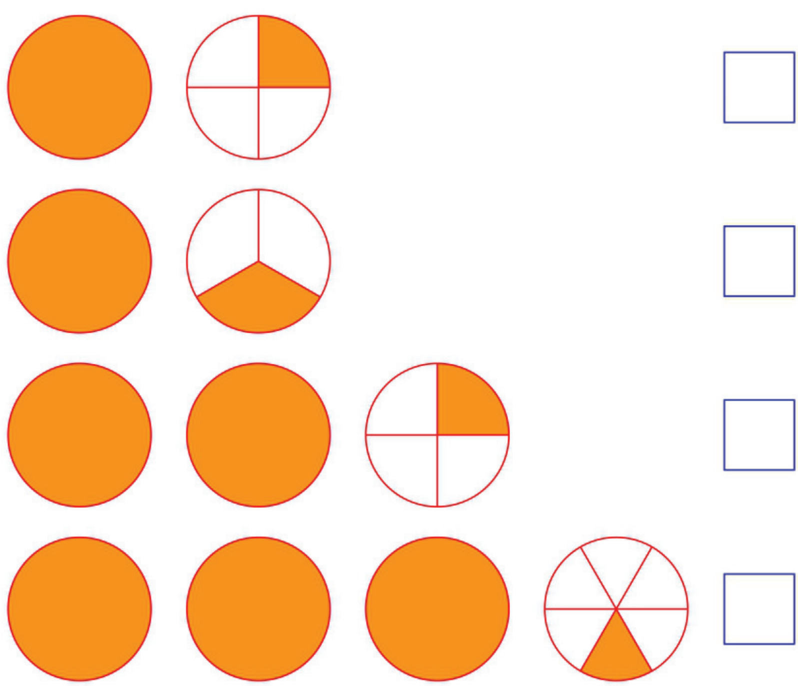


One and one third is written $1\frac{1}{3}$.

We can also have lengths like these. If a one metre long ribbon and half of another one metre long ribbon are joined end to end, the length is $1\frac{1}{2}$ metres.



In each of the pictures below, find how much is coloured and write it as a fraction in the box on the right.



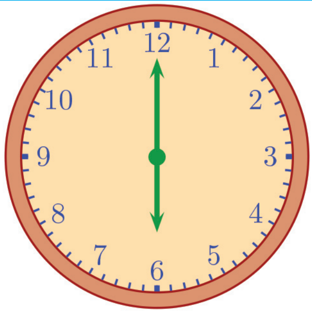
6

With the Times

Study trip

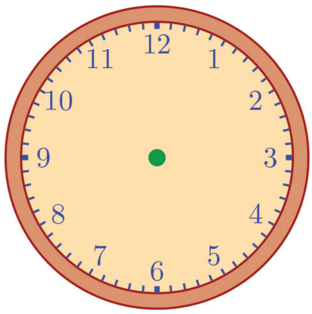
The class returned after a one-day study trip. They started at 6 in the morning. It was 9 at night when they came back. See how they spent their time.

Time they started



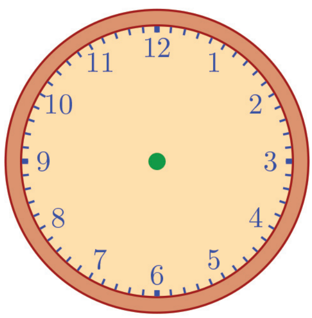
- - - - - -

Breakfast



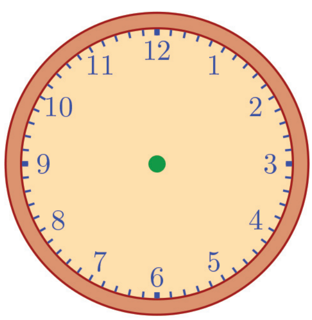
8 : 00

Zoo visit



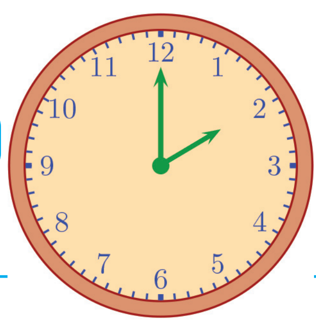
8 : 30

Lunch



1 : 30

Planetarium



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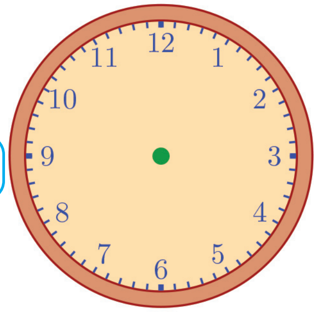
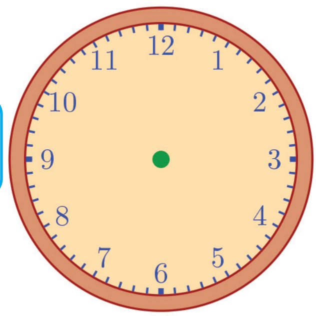
Beach

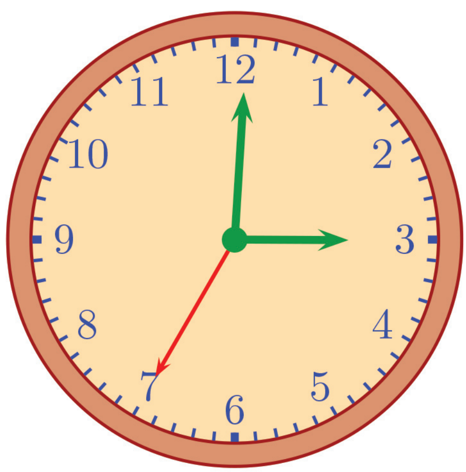


5 : 00

Time they reached back



Hands of a clock



Look at the picture of the clock.
How many hands does it have?
What does each hand represented?

- Which hand turns the fastest?
- How much time does it take to complete one rotation?
- How much time does the minute hand take to complete one rotation?

- What about the hour hand?

Clock Hands	Time for a Rotation
Second hand	1 minute
Minute hand	1 hour
Hour hand	12 hours

- How much time does the hour hand take to start from 12 and return to 12 ?
  - * By this time, how many rotations would have the minute hand made?
  - * What about the second hand?
  - * How many rotations does the hour hand complete in a day?

1 day = 24 hours

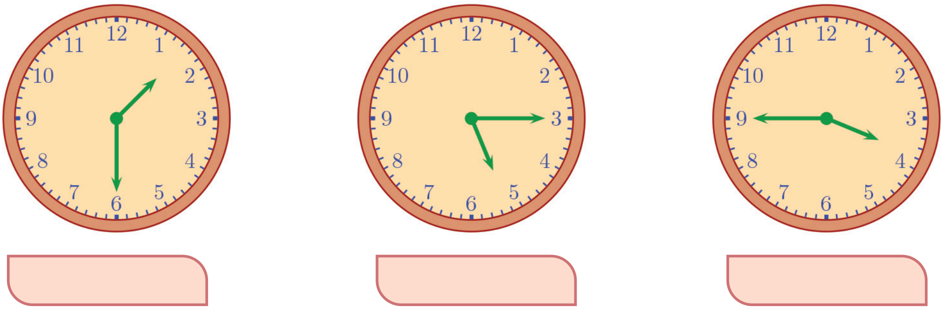
1 hour = ... minutes

1 minute = ... seconds

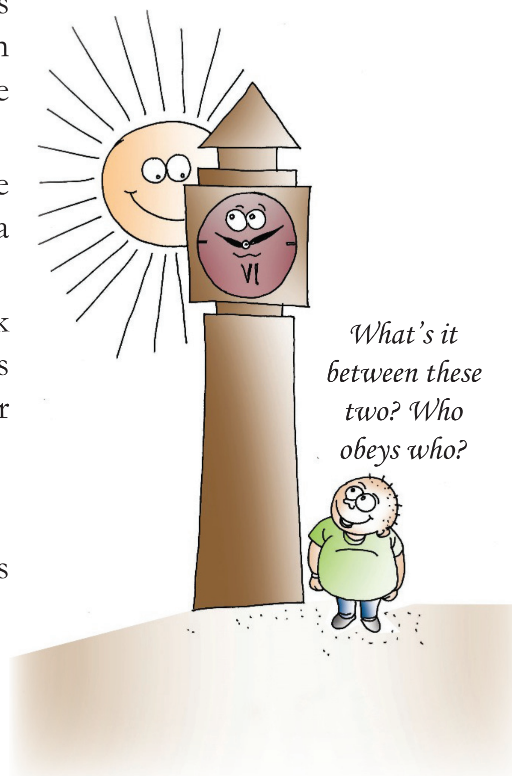
- How many minutes are there in a day?
- How many seconds?

Fractions of time

What's the time shown in each clock?



- The first clock shows 30 minutes past 1; and 30 minutes is half an hour, right? So, we say the time is half past one
- Similarly the time shown in the second clock can be said to be a quarter past five.
- The time shown in the third clock can be said to be three quarters past 3 or (more usually) a quarter to 4.



1. Draw clocks showing the times given below.

(i) Quarter past 2

(ii) Quarter to 10

(iii) Half past 11

2. Complete the table below:

120 minutes	2 hours
150 minutes	------ hours
------ hours	210 minutes
3 minutes	------ seconds
$\frac{1}{4}$ hours and 45 minutes	------ hours
5 hours 59 minutes and 60 seconds	------ hours

3. School starts at 10 in the morning and continues to 4 in the afternoon. There are intervals from 11:20 to 11:30 in the morning, 12:50 to 1:45 in the afternoon and 3:10 to 3:20 in the evening. How much time do students get for their studies?

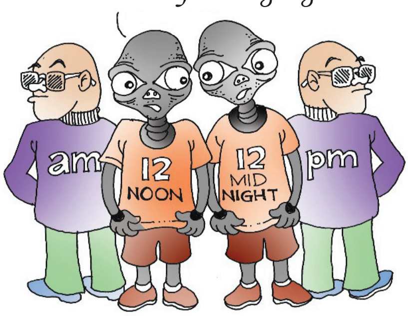
Before noon and after noon

You might've seen *am* or *pm* together with time in many places. What do they mean?

8 am means 8 in the morning and 3 pm means 3 in the afternoon.

So, what about 10 *am* and 5 *pm*?

The time from 12 midnight to 12 noon is denoted using *am* and the time from 12 noon to 12 midnight is denoted using *pm*.



Complete the table

7 in the morning	7 *am*
7 in the evening	------------
9 in the night	------------
5 in the evening	------------
11 : 30 in the morning	------------
-------------------	6 *pm*
-------------------	4 *am*
-------------------	11 : 30 *pm*

- A person started from Thiruvananthapuram at 8 *am* on January 7th and reached Hyderabad at 3 *pm* on January 8th. How long did the journey take?

- An office works from 9 *am* to 5 *pm*. One of the employees went out from 11 *am* to 1:30 *pm*. How long was the person in the office?

24 hour clock

Railways and some other agencies use a 24-hour clock. So, 21:10 means 9 hours and 10 minutes after 12 noon; that is, 9:10 in the night. Thus 20:50 is

$$20 : 50 - 12 : 00 = 8 : 50 \; pm$$

This train reaches Mangaluru next day at 11:30. Is it *am* or *pm*?

In the 24-hour clock format, for times between 12 to 1 in the night, hours are denoted as 0. Thus 00:30 means 12:30 am

- A bus started from Kozhikode at 15:30 and reached Thiruvananthapuram at 2:30. How much time did the journey take?
- A flight started from Kozhikode at 18:40 and reached Delhi via Mumbai at 00:10. How much time did the journey take?

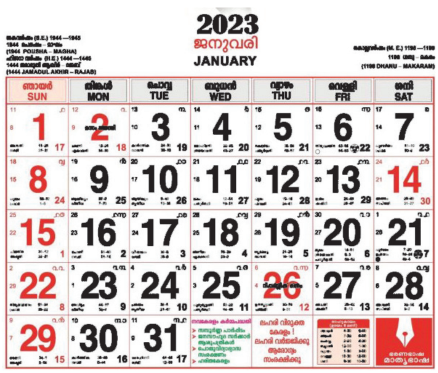
Complete this table

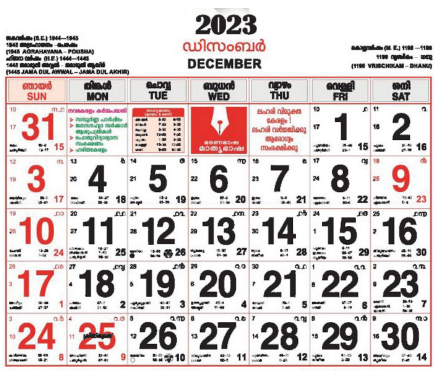
24 hour clock	12 hour clock
23 : 30	11 : 30 *pm*
8 : 00	------------
------------	1 : 30 *pm*
16 : 25	------------
------------	10 *am*
------------	------------
------------	------------

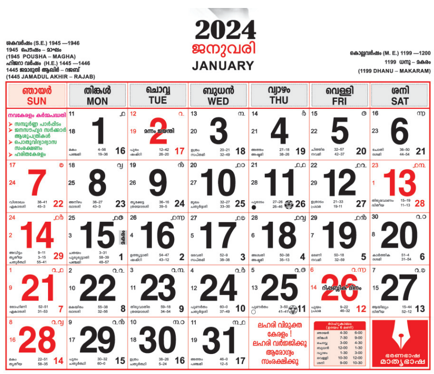
Before and After

In Latin, the time before noon is referred to as ante meridiem and the time after noon is post merediem. These are shortened to '*am*' and '*pm*' now.

Through the calendar







A year usually has 365 days, which is 52 weeks and one day.

A leap year has 366 days, which is 52 weeks and 2 days.

Other calendars

What are the different systems shown in calendar sheets?

- Gregorian calendar (sometimes called English calendar in our state)
-
-
-

Find the names of the months in each system and write them down.

See how the dates according to various systems are placed in your calendar.

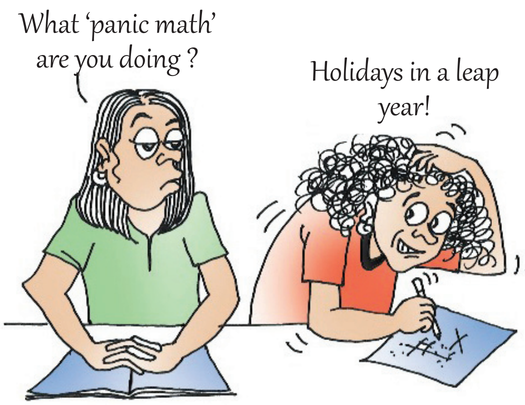
Leap year

A year is usually the time taken by the Earth to complete one orbit around the sun. This is about 365 days and 6 hours. So, if a year is taken as 365 days, then in 4 years there will be a difference of one day. If this is is continued, after several years, the calculation of seasons will be very much incorrect. As a way out, one day is added every four years to make the length of that year 366 days. Such years are called leap years. The extra day is added to the month of February, so that in a leap year, February has 29 days

To check whether some year is a leap year or not, divide it by 4; if there's no remainder, then it's a leap year. For example, 2020 is a leap year; and the next leap year is 2024

To make the calculations more precise, adjustments are made. For the years which are beginning of centuries, only those divisible by 2000 are taken as leap years. Thus, for example, 1900 is not a leap year, while 2000 is.

- Look at the calendar for this year. How many days does February have?
- Which is the next leap year?
- Which months of this year have 5 Mondays?
- In a certain year, there were 5 Wednesdays in October, but only 4 Thursdays. What day of the week was the first of October that year?



- The sum of the dates of two Sundays in a month is 11. What day of the week is the first of that month?
- How many times each day of the week occurs this year? Which day occurs the most number of times?

CONSTITUTION OF INDIA

Part IV A

FUNDAMENTAL DUTIES OF CITIZENS

ARTICLE 51 A

Fundamental Duties- It shall be the duty of every citizen of India:

(a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

(b) to cherish and follow the noble ideals which inspired our national struggle for freedom;

(c) to uphold and protect the sovereignty, unity and integrity of India;

(d) to defend the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;

(f) to value and preserve the rich heritage of our composite culture;

(g) to protect and improve the natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(i) to safeguard public property and to abjure violence;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievements;

(k) who is a parent or guardian to provide opportunities for education to his child or, as the case may be, ward between age of six and fourteen years.

CHILDREN'S RIGHTS

Dear Children,

Wouldn't you like to know about your rights? Awareness about your rights will inspire and motivate you to ensure your protection and participation, thereby making social justice a reality. You may know that a commission for child rights is functioning in our state called the ***Kerala State Commission for Protection of Child Rights.***

Let's see what your rights are:

- Right to freedom of speech and expression.
- Right to life and liberty.
- Right to maximum survival and development.
- Right to be respected and accepted regardless of caste, creed and colour.
- Right to protection and care against physical, mental and sexual abuse.
- Right to participation.
- Protection from child labour and hazardous work.
- Protection against child marriage.
- Right to know one's culture and live accordingly.
- Protection against neglect.
- Right to free and compulsory education.
- Right to learn, rest and leisure.
- Right to parental and societal care, and protection.

Major Responsibilities

- Protect school and public facilities.
- Observe punctuality in learning and activities of the school.
- Accept and respect school authorities, teachers, parents and fellow students.
- Readiness to accept and respect others regardless of caste, creed or colour.

Contact Address:

Kerala State Commission for Protection of Child Rights
'Sree Ganesh', T. C. 14/2036, Vanross Junction
Kerala University P. O., Thiruvananthapuram - 34, Phone : 0471 - 2326603
Email: childrights.cpcr@kerala.gov.in, rte.cpcr@kerala.gov.in
Website : www.kescpcr.kerala.gov.in

Child Helpline - 1098, Crime Stopper - 1090, Nirbhaya - 1800 425 1400

Kerala Police Helpline - 0471 - 3243000/44000/45000

Online ***R. T. E Monitoring : www.nireekshana.org.in***